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ABSTRACT

This paper provides a survey of the field of technology in home economics. Part 1 previews the many available definitions of technology and attempts to synthesize what technology is. Five defining attributes of technology are identified, providing a structure for the subsequent discussion. Part 2 elaborates on the nature of home economics as currently taught in Scottish secondary schools. Part 3 explores how technology as it is here interpreted might, in general terms, be integrated into home economics courses without damaging the subject's integrity. Part 4 is essentially a compendium of examples of technology in home economics and collects information from journal articles and other published sources, from work proceeding in Scottish education authorities, and from a number of initiatives and projects underway in England and Wales. Part 5 considers briefly the implications for the individual home economics teachers, for the profession as a whole, and for education authorities and other bodies of placing home economics in the technological activities and applications mode. Appendixes provide detailed information on definitions of both technology and home economics, the aims and objectives of courses in the latter, some suggestions for teachers, and a five-page bibliography. (YLB)

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TECHNOLOGY IN HOME ECONOMICS

CE 056 168

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Introduction

We are conscious that the material reviewed in this paper represents an incomplete survey of the field of technology in home economics. In the time available it was not possible to track down every reference we came across. We are, however, grateful to those whom we contacted, initially by telephone. Many provided us with detailed information at that time; others responded by sending us copies of their reports, pupil materials and other documents. Unfortunately, some of the promised documents failed to arrive in time to be considered in the compilation of this review. We trust that we have reported accurately the information which we received from a wide selection of sources. The interpretations placed on that material, however, remain our own.

In Part 1 of the paper we review the many available definitions of 'technology' and attempt to synthesise what 'technology' is. This proved to be a more difficult task than might have at first appeared but we were able to identify five 'defining attributes' of technology which provide a structure for the subsequent discussion.

Part 2 elaborates on the nature of home economics as currently taught in Scottish secondary schools. Our task in Part 3 is to explore how 'technology' as we have interpreted it, might, in general terms, be integrated into home economics courses without damaging the subject's integrity.

Part 4 is essentially a compendium of examples of technology in home economics. Information has been collected from journal articles and other published sources, from work proceeding in Scottish education authorities and from a number of initiatives and projects underway in England and Wales.

In Part 5 we briefly consider the implications for individual home economics teachers, for the profession as a whole and for education authorities and other bodies of placing home economics in the 'technological activities and applications mode'.

Appendices provide detailed information on definitions of both technology and home economics, the aims and objectives of courses in the latter and some suggestions for teachers. Finally there is an extensive, though necessarily incomplete, bibliography of works consulted during the preparation of this paper.

Our thanks are due to Janet Chambers, research assistant at SCRE, for making many of the preliminary contacts with practitioners, to Kay Young for typing the document and to John Herdman and Anne Bankowska for proof reading. We are also grateful to home economists and others, too numerous to mention individually, who provided us with information in person, by telephone, by letter and by sending us copies of their documents and materials relating to this topic.

Part 1: What is technology?

The importance of technology in the curriculum

Recent years have seen increasing claims for the importance of technology in the curriculum. The Consultative Committee on the Curriculum's (CCC) Education for an Industrial Society Project, the Technical and Vocational Education Initiative (TVEI), the introduction of a Technological Activities and Applications mode, the increasing use of SCOTVEC modules in schools and the advent of Standard Grade Technological Studies are all indicators of the trend.

Many of the arguments in support of such developments have been vocational in orientation. The Committee on Secondary Education (COSE) Discussion Paper (1985), for example, based its case for the inclusion of technology in the secondary curriculum primarily on the national need for adaptable young people educated in the use of new technologies to provide the future workforce. However, other themes, such as awareness and knowledge of the environmental consequences of technological activity, are also to be found.

What is technology?

Perhaps because of the extent of recent interest in what is an expanding area of development, the range of accounts of what technology comprises is substantial (for a list of 'definitions', see Appendix 1). It is also confusing, for in addition to attempts to define 'technology' *per se*, there are references to technological 'knowledge', technological 'awareness', technological 'activity', technological 'capability' (or practical capability) and technological 'behaviour'.

The CCC's Committee on Technology (COT) considered many of these definitions before choosing the following in its report which was published as a COSE Discussion Paper in 1985.

> Technology is concerned with the identification of some of the material needs of man and the endeavour to satisfy those needs by the application of science and the use of materials, resources and energy. It is concerned with solving problems where there is no right or wrong answer, only good and bad solutions to a problem. Technological behaviour requires activities that are creative and demanding, where the laws and principles of science, the constraints of society and economics are applied to satisfy human needs. Technological behaviour involves approaches and techniques, such as systems analysis, problem identification, decision making, planning, idea communication and solution evaluation, which are more than pure science or craft. (pp 3-4)

Another insight into how 'technology' is conceptualised in Scottish education is available in the CCC's description of the Technological Activities and Applications mode (CCC, 1987). As is shown in Table 1, this is described as the 'development of technological and practical skills, designing and using artefacts, practical problem solving'.

These definitions are largely compatible with other United Kingdom interpretations of the concept of technology, although they are perhaps more exclusively oriented towards practical activities than is generally the case. Thus for example, in addition to identifying skills such as investigation, invention, implementation, evaluation and communication as part of technological capability, an Assessment of Performance Unit study (APU, 1983) considered that knowledge and value judgements were also involved (Table 2). Similarly, Black and Harrison (1985) identified the importance of giving children an awareness of technology and its implications as a resource. There is more emphasis on impact on the 'man-made' environment or adaptation of the environment in some definitions (APU, 1981, Geen and Daniels, 1988) but these may be implicit in the Scottish definitions. Geen and Daniels (who are home economists) do, however, adumbrate the problem-solving component by underlining the importance of *systematic* study of the design, production and use of artefacts as well as *systems and ideas*. They also consider it important that technology be characterised by a reflection of a desire for efficiency which they define as the achievement of objectives for the minimum expenditure of time, resources, labour and energy.

Table 1: S3/4 Technological Activities and Applications mode		
DESCRIPTION	Development of technological and practical skills, designing, making and using artefacts, practical problem solving.	
CORE AREA Essential contributions to the mode	Accounting and finance, computing studies, craft and design, home economics, office and information studies, social and vocational skills or technological studies. [or appropriate activities from these or from others below] Minimum 5% of curriculum.	
ELECTIVE AREA (a) Additional contributions to the mode drawn from available full SCE courses	accounting agricultural science anatomy, physiology and health engineering horticultural science navigation	seamanship and nautical knowledge secretarial studies technical drawing
ELECTIVE AREA (b) Additional fields of study/activities contributing to the mode drawn from recommended SCE short courses, NC modules or from school programmes	agriculture catering computer applications 'engineering' functional design graphical communication horticulture industrial studies	enterprise careers keyboarding skills information technology nautical studies parental and child care

Based on CCC (1987) *Curriculum Design for the Secondary Stages: Guidelines for Headteachers.*

In summary, therefore, perusal of the range of definitions suggests that if account is to be taken of all of them, *technology* is concerned with:

> the identification and satisfaction of some of the material needs of mankind;
>
> and systematic study of the design, production and use of artefacts, systems and ideas.

The study of technology is also characterised by:

> a focus on the 'man-made' environment or adaptation of that environment;
>
> solving problems where there is no right or wrong answer, only good and bad solutions to a problem;
>
> and a desire for efficiency which might be defined as the achievement of objectives for the minimum appropriate expenditure of time, resources, labour and energy.

Technological capability might in turn be defined in terms of:

> *awareness* of technology, as defined above, and its implications as a resource;
>
> *knowledge* of the potential application of science and the use of materials, resources and energy to satisfy technological needs within the constraints of society and economics;

the development of *skills*, including systems analysis, problem identification, decision-making, design, planning, construction, idea communication and solution evaluation which will facilitate the application of such awareness and knowledge in identifying and solving problems within the area of technology outlined above.

Table 2 The discrete elements of technological capability

Skills	Knowledge	Value Judgements
Skills of Investigation including the examination of problems, searches for relevant information **Skills of Invention** including thinking of alternative solutions to problems **Skills of Implementation** including selecting and planning the process of making use of hand and machine tools, monitoring and controlling details of operation **Skills of Evaluation** including assessment of the activity against objective criteria **Skills of Communication** including speech, writing, graphics	**Knowledge of Energy** including knowledge of various forms/sources of energy, methods of storing, converting and transmitting energy and of energy costs **Knowledge of Materials** including knowledge of properties and limitations of materials; of sources and costs of materials, of processing, manipulating and connecting materials **Knowledge of Control** includes knowledge of open and closed loop systems; of feedback; of how systems are monitored	**Aesthetic** including those relating to proportion, colour, texture and on the relationship between workmanship, tools, materials **Economic** including those relating to economic viability in terms of supply and demand and of intrinsic value **Technical** including balancing views of efficiency, robustness, flexibility, reliability, precision and safety **Moral** including judgements on human needs and on long term environment effects

From APU (1983) *Report of a survey of design and technological activities in the school curriculum.*

While superficially it may appear straightforward to draw these attributes of the concept 'technology' together, it is important to note that doing so may conceal a number of tensions which could pose problems for curriculum design. For example, Scottish definitions lay stress on *designing, making and using artefacts*. This, or similar phrases, is to be found in many definitions (eg HMI, 1982; APU, 1983; Clegg, 1987; Geen and Daniels, 1988), so it may be reasonable to assume that it is one of the defining characteristics of technological activity in schools that pupils will design and make something and then evaluate its use. However, some writers (eg Kelly *et al*, 1987) have expressed the view that in developing technological capability in pupils the *processes* involved may be more important than the final product.

The CCC description of the Technological Activities and Application mode also includes the phrase *'practical problem solving'* which is common in other definitions (eg DES, 1985; APU, 1983; Schools Council Project Technology in CCC, 1985). The term 'problem solving' occurs in many Standard Grade course *Arrangements* but it is important to recognise that 'problem solving' and 'practical problem solving' are not entirely synonymous. Problems can be solved in mathematics, for example, without recourse to practical activity. Technology involves more than practical activity. In home economics and 'social and vocational skills' pupils might be asked to suggest how a family could balance its domestic budget, or in geography pupils could consider the options available to a local planning committee in relation to a supermarket or other development. These would be problems to solve but they would not involve technological activity. Practical problem solving involves something more, and unless this is present it will not satisfy the requirements of technological activity as set out above.

Technology and the existing curriculum

Technology as a specific area of study is manifested in the Scottish curriculum by courses leading to a range of SCOTVEC modules, and a Standard Grade course in Technological Studies' (TS) will be available for certification in 1990. The latter aims to

> develop an understanding of technology as it is applied in industry and commerce [...], an awareness of the applications of technology in the community [...], a recognition of the responsibility to humanity and environment that they impose [...], an appreciation of the need for flexibility by the individual with regard to work practices.
>
> *(Standard Grade Arrangements for Technological Studies, SEB, 1988)*

In England and Wales its counterpart - Craft, Design and Technology (CDT) - is described in a DES leaflet as aiming to:

> prepare pupils for life in an industrial society. It embraces the whole range of practical activities that take place in school workshops in which pupils are encouraged to design and make their own products in different materials. [...] It is not just a question of handling tools. The CDT teacher's job is to channel pupils' natural creativity towards the ability to produce things which serve a real purpose. So the pupils need to learn to appraise a specific problem with imagination, foresight and judgement and - above all - a methodical approach.
>
> *(Central Office of Information, 1988)*

The vocational and 'technical' slant of these courses is clear. But many pupils, who will eventually earn their livings in other fields, will also benefit from an understanding of technology. Accordingly, it is particularly important to note that in addition to 'technological studies', the CCC description of the Technological Activities and Applications mode is couched firmly in terms of the potential of a wide range of subjects to offer the kinds of experience which will deliver technological capability.

The case for a cross-curricular conceptualisation of technological awareness and activity has also been made in England and Wales. Black and Harrison (1985) for example, particularly identified the crucial contribution made by technical and home economics departments to 'technological activity' (or 'designing and making'), though they recognised that 'technological awareness' and appreciation could, and should be, integral to the study of a whole range of subjects and courses.

The COT Report (1985) provided examples of 'technological activity' in home economics, craft and design, social and vocational skills and technological studies. The CCC recommendations for the 'technology' mode identify a number of Standard Grade subjects within the core in addition to other SCE courses and modules in the 'elective' area (See Table 1). This could, however, be argued to be unreasonably restrictive. The social subjects, for example, could be expected to make a contribution to pupils' technological awareness (eg a study of the application of intermediate technology in third world countries; a consideration of the causes and effects of atmospheric and other types of pollution; looking at the local provision of water, sewage disposal and other utilities). Furthermore, pupils can use technological hardware, especially computers, in almost any subject to access data-bases, to store information and to perform statistical procedures or produce graphics.

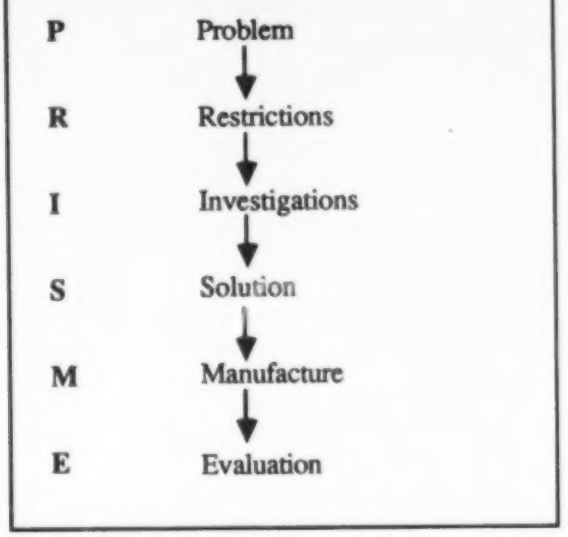
Indeed, it is perhaps interesting that few of the named Standard Grade subjects contain any *explicit* reference to technology or technological capability in their *Arrangements* documents, although it is not difficult to see how each of them could make a contribution. But the same applies, as we suggest, to other subjects as well.

Teaching technology

How, then, does 'technology' manifest itself in the classroom? At the simplest level a number of development projects have been based on the PRISME and similar, linear models. The PRISME model (see Figure 1) for the design process, devised and promulgated in the Scottish Technical Education Modules for S1/2, and similar models, suggest a neat sequence of

technological activities towards a given goal. This simplified model has proved very robust and has been used to introduce the design process to many pupils. From its origins in technical education it has been taken and adapted for use in other subject areas.

Figure 1: The PRISME model



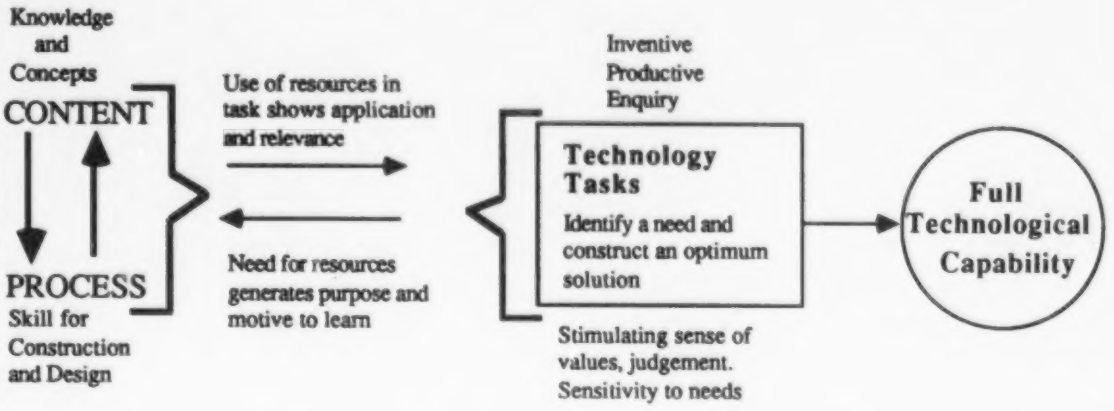
In reality, however, as Kelly *et al* (1987) suggest, the design process is more cyclical and may involve loops. It may be appropriate to manufacture a model or mock-up at the investigation stage and evaluation must enter the activity before a selection is made. (See also SEC, 1986). Although such models may be useful in clarifying ideas, Kelly *et al* found that teachers often find 'fitting the models to what pupils actually do' difficult. There is a danger that procedural models will impose an artificial and constraining framework on pupil activities with a greater concern for 'doing all the stages in the process' rather than with developing pupils' capabilities and creativity.

They therefore suggest an interactive rather than a sequential model in which there is continuous interplay between thought and action. Mental activities include 'speculating' about possibilities, 'exploring and developing' ideas, 'refining and detailing' plans and 'validating and judging' results. Throughout, these interact with practical, manual activities including 'sketching', 'drawing', 'modelling', 'building a prototype', 'testing and modifying the design'.

Using this interpretation of technological activity they were able to identify four stages or phases of technological activity including task identification, investigation, generation and development and evaluation, though they were reluctant to assign any particular technological activities to particular phases. They suggest that pupils move from one to the other and back again when addressing a 'task'. They stress that the whole technological procedure is underpinned by 'knowledge and skills' (the content of technological education) which pupils have already acquired or need to find out before they can proceed. Although the 'procedure' itself may be said to be 'content free' the pupil activity cannot be. This view is similar to that put forward by Black and Harrison (1985).

They propose a model of technology education (Task-Action-Capability-TAC - see Figure 2) which highlights the interactive process between the *resources* of knowledge and skills with *technology tasks* which cumulatively leads to *technological capability*. The authors admit that this model is not always readily understood by teachers, but perhaps its most important feature is the way it underlines the integrated nature of the components which go to make up technological capability.

Figure 2: The TAC model of technology education.



(From BLACK and HARRISON, 1985. p7)

In the final report of their project, Black *et al*, (1988) recommend a seven-point plan for 'technology in the national curriculum' (p7). In this they stress the cross-curricular nature of technology education and recommend that pupils have both 'first-hand experience of technological tasks' and 'second-hand' study of technological applications in both the historic and contemporary contexts. They further report that

> teachers have been impressed by the motivating influence of learning (and the associated reduction in discipline problems) of tasks in technology which have been planned and implemented using the framework.

While in Scotland we do not have a 'national curriculum' *per se* , the SCCC recommendation that a Technological Activities and Applications mode be part of the experience of every pupil underlines the importance of this area of study.

This preliminary section of our report has suggested that pinning down 'technology' and 'technological capability' is no easy matter. However, the potential of many subjects, including home economics, to provide learning opportunities in this area has been made clear. In the following section we will consider the nature of home economics itself and Part 3 will relate this to technology as we understand it.

Part 2: What is home economics?

The traditional notion of home economics as the subject which imparts the skills of cooking and sewing has long been eschewed by subject specialists, though this image may still linger elsewhere. In the past 'housecraft' or 'domestic science', as it was then known, was clearly the preserve of female pupils, and the less academic ones at that. Today, there is a commitment to 'home economics for all' (Turner *et al*, 1986), perhaps because of equal opportunities legislation or perhaps because there is growing recognition that both sexes need to be equipped with the skills taught by home economists. What many home economists have not yet clarified is what their subject comprises today. There are some (eg Whitfield, 1969) who argue that it embraces all manner of content and is the only subject to make a contribution to all six of Phenix's (1964) 'realms of meaning' or most of the Munn 'modes' (SED, 1977). Most would not claim so much for their subject and would wish to define more manageable boundaries.

Some definitions

In 1983 the Equal Opportunities Commission defined the subject as follows:

> Home economics is the study of the household group, its values and relationships, and its interaction with the community of which it is a part. It is equally concerned with the development of the range of skills necessary for the management and organisation of available resources such as money, time, energy and human potential to meet needs (and wants) in the changing society.
>
> (Equal Opportunities Commission, 1983)

Few home economics teachers would disagree with this as a general statement but it lacks specificity. (See Appendix 2 for other definitions of home economics).

In Scotland, a definition was provided by the CCC (1987b) in *Curriculum Guidelines for Home Economics* S1/2 as follows:

> Home economics is the study of the family group - its members' needs and relationships, its organisation and management, and its relationship to the community of which it is a part.

The emphasis placed on the *needs of family group members* and on *organisation and management* reflects the changed focus of the subject and suggests links with the definitions of technology discussed in Section 1. However, at the S1/2 stage, pupils need to absorb a certain amount of basic knowledge, especially about safety and hygiene, which they cannot reasonably be expected to 'discover' for themselves. Similarly, pupils need to be able to draw upon a repertoire of basic skills, in both the practical and the information-gathering aspects of the subject, before they are able to operate independently. To take a simple example - a pupil cannot be expected to plan and prepare a two course meal if he has not first had the opportunity to learn how to operate the cooker and to master basic food preparation processes or had the chance to learn something about nutritional balance. There is apparently a hierarchy of knowledge and skills within the subject. The basics are acquired in S1/2 (see Appendix 3.1) and then, as pupils mature, they should be able to apply the knowledge and skills already gained in new situations, stopping, when necessary, to develop new skills or to find out new information (see Appendix 3.2 for Standard Grade Aims).

Most home economics courses, in Scotland as well as south of the border, still focus on the three main content areas of:

home and family;
nutrition and food;
textiles;

although the emphasis is now officially placed upon skills and processes rather than upon content (see, for example, Standard Grade Objectives, Appendix 3.3). The focus of most home economics courses is, as one would expect, the home, and the inter-relationships between

various aspects, such as healthy eating and family budgets, are constantly pointed out. The GCSE National Criteria (DES and Welsh Office 1985) for home economics courses in England and Wales stress the integrated nature of home economics (see Appendices 3.4, 3.5, 3.6 for GCSE Aims).

It was this 'inter-relatedness' which led to the decision to abandon the two separate 'O' Grade subjects - *Food and Nutrition* and *Fabric and Fashion* - and to opt instead for one integrated Standard Grade course - Home Economics.

Home economics curricula

Despite the current emphasis given to 'skills and processes' pupils must develop these within a context. In home economics that context is, quite naturally, the home - part of the 'man-made' environment. The subject content map, drawn up by the *Monitoring of Technical Education and Home Economics at S1/2 Project*, which received professional support, comprised the following broad areas.

Food:	Nutrition, practical skills, utensils/equipment, sensory factors, hygiene - kitchen and personal, cooking terms;
Health:	Varied diet, good health;
Fabric:	Fibres, fabrics, practical skills, equipment, sensory factors, terminology;
Safety:	in the kitchen, in the home, tools/equipment;
Consumer Education:	Advice organisations, informative labels/handling, information leaflets/ advertising, comparison of similar products.

(Dow *et al*, 1986)

Results from this project indicate, however, that there were significant differences in course content across the country (SED, 1988).

Appendix 3.1 lists the aims put forward by the CCC in 1987 for S1/2 courses in home economics. It is interesting to note that there is no specific reference to technology though it is implied in Aim 2 ('designing and marking'), Aim 4 ('awareness' or 'knowledge') and Aim 8 ('efficiency')

For pupils who continue to study home economics in S3/4, there is usually an initial period of consolidation when knowledge and skills learned earlier are revised and augmented. The focus remains on learning how to meet 'the needs of different members of the family group' which necessitates making 'decisions'. Pupils' ability to make a 'critical choice' is developed as a result of the learning experiences provided. The value of organising one's time efficiently and of using resources economically is stressed, and pupils are given opportunities to develop these 'organisational and management skills'.

At Standard Grade the 'contexts for learning' within which such abilities are to be developed are identified as 'health', 'materials and resources' and 'individuals and families'. These contexts are very broad and allow home economics teachers to exercise judgement about the actual content of their courses, once the prescribed, 'essential knowledge' in each element has been covered (see Appendix 3.7). Again, although there are no explicit references to 'technology' *per se* there are opportunities for teachers to introduce pupils to technological activities and applications within the flexible boundaries of these contexts. Although Standard Grade courses are only just beginning there seems to be consensus that at least one topic will deal with aspects of 'healthy eating', while another will look at 'labelling' in some form or other. When the focus is on 'individuals and families' the special needs of the elderly, of small children, of those needing special diets, of the handicapped will be considered. Another popular topic revolves around 'planning an event'. Stress is also placed on 'hygiene and safety'. This topic may be explored in the home and kitchen and could lead separately to a consideration and evaluation of

electrical appliances (technological applications), the development of rules for safe food storage or laundry procedures (systems).

Again the Aims and Objectives of Standard Grade courses (Appendices 3.2, 3.3) make no overt reference to 'technology' nor to 'technological activities'. That opportunities exist within the course structure, especially in the 'practical and organisational skills' element, to introduce pupils to some aspects of technology, is clear. Aims 3 and 4, in particular, are capable of interpretation in a technological way.

Specialisation becomes more pronounced at Higher Grade where, under the new *Arrangements*, candidates will have to pursue an individual study which will account for approximately 41% of their final mark. Nevertheless the focus remains on preparing young people for adult living by giving them opportunities to acquire relevant knowledge, to develop organisational abilities, to encourage flexibility in the face of change. An emphasis is placed on 'problem solving as a creative and integrated activity' (see Appendices 3.8 and 3.9). Less emphasis is placed on practical skills than previously.

Despite the changes which have taken place in the rhetoric of home economics over recent years the focus of the subject remains the same. It aims to prepare pupils for adult life. As adults we are constantly faced with decisions - about food, clothing, housing, financial services. The study of home economics at school aims to provide pupils with the knowledge and skills necessary to 'make a selection on an analytical basis' (SEB, 1987g). This point was further made in a recent research study of home economics practice in Scotland.

> It aims to provide pupils with a coherent map of knowledge, skills and values so that they can make informed decisions about key aspects of the home. (Cumming *et al* , 1985)

The importance of educating young people to be flexible enough to cope with imminent technological and associated social changes as adults was stressed in 1984, by Bone, speaking at the National Course for Home Economics (Bone, 1984). He suggested that the subject had some 'longstanding advantages' in helping pupils to come to terms with the expected changes. In the next section we shall look at how home economics is equipped to foster a technological approach and how the subject could contribute to pupils' experience of the 'technological activities and applications' mode.

Part 3: The contribution of home economics to the technological activities and applications mode

Introduction

If home economics in Scotland is to make a valid contribution to secondary pupils' experience of the Technological Activities and Applications mode of learning, in which it has been placed, it is necessary to define what that contribution should be. Some home economists (eg NATHE, 1988, Yorke, 1988) argue that a technological approach can be applied appropriately to most aspects of the subject. On the other hand there are those within the subject who still cling to the old craft skills of cooking and sewing. Yet others warn against losing valuable home economics content in the mad rush to jump onto the technology bandwagon (eg Scriven, 1988, Thorne, 1988). There is, nevertheless, general agreement within the subject, in England and Wales as well as in Scotland, that home economics *can* provide pupils with experiences which make a contribution to their technological education and which are sufficiently distinct from other aspects of technology to be worthy of attention in their own right. In this section we will explore the claims of home economics to make a contribution to the Technological Activities and Applications mode and exemplify that contribution.

The relative status of home economics and technology

Technology, for so long the preserve of pupils labelled as 'non-academic', has had a good press recently and has been recognised as an important part of young peoples' education. The importance placed upon it by the government is witnessed by the Technical and Vocational Educational Initiative (TVEI) and the related in-service scheme (TRIST). In England and Wales technology is recognised as part of the core in the National Curriculum. Now that Scotland too has a Technological Activities and Applications mode which includes home economics, perhaps it also will have its status enhanced by association. In this regard we note that since Moray House College of Education re-organised its academic departments in 1987 home economics has been part of the Science and Technology department.

Is it significant that the CCC's Project Planning Group for Education for the Industrial Society Project in 1983 did *not* include a home economist, and that amongst the over 200 people consulted during the project only two are designated as home economists? Apparently it was thought that home economists had little to contribute in this field - yet the title of the report was *Education for Life and Work*. This lack of acknowledgement of the role that home economics can play in equipping pupils for adult life is an indication of the low esteem in which the subject has been held by outsiders until now. The Royal Society of Arts' Education for Capability campaign similarly has no home economists on its committee and none of the projects it supported was within the subject (RSA, N.D.). Perhaps of greater concern, it is worth noting that the TVEI Advisers in Scotland did not include any examples of work in home economics departments in their *Areas of Particular Interest in TVEI in Scotland* (TVEI, 1988).

Technology and Scottish home economics syllabi

In Part 1 we refined, from a host of definitions of technology, technological activity and technological capability, a series of 'defining characteristics' which can be summarised as follows:

1. a concern with some of the material needs of man;
2. a systematic study of design, production and use of artefacts, systems and ideas;
3. adapting the man-made environment;

4. open-ended problem solving;

5. a focus on efficiency.

We also pointed out that the description provided for the Technological Activities and Applications mode in Scotland -

> Development of technological and practical skills; designing, making and using artefacts; practical problem solving

is both narrower and more practical in orientation than the subject defined by the five attributes above.

If we take these five 'defining characteristics' in turn and relate them to the recommended learning outcomes and course objectives for each stage of the Scottish secondary school, it should be possible to see to what extent home economics can make a contribution to the Technological Activities and Applications mode. At all three stages of home economics courses in Scotland there appear to be aspects of the subject which coincide with the listed characteristics. In other words, opportunities do exist within home economics for technological activities to be introduced.

At the S1/2 stage the curriculum is not specified in detail though the subject is expected to cover 'aspects of food studies, textiles studies, health education and consumer education' (CCC, 1987 p30). Depending on how these topics were approached there could be opportunities for pupils to learn about efficiency and economy in coping with human needs (characteristic 1). Similarly aspects of 'food studies' and 'textiles' could include a 'systematic study of design, production and use of artefacts, systems and ideas' while other activities related to these themes could involve pupils in 'adapting the environment'. Further, Objective 8 (see Appendix 3.1) refers to 'managing their own time and money' (characteristic 5). Although some teachers may feel that pupils at this level lack some of the fundamental knowledge and basic skills required to undertake completely open-ended problem-solving tasks, there are others who see such problem-solving activities as an ideal method by which to introduce pupils to new information and processes. It appears, therefore, that aspects of all five 'characteristics' could be encompassed within a study of home economics at the S1/2 level.

At S3/4, in addition to the 'course objectives', reference should be made to the three 'contexts for learning' defined in the Standard Grade *Arrangements* (p10). These contexts are 'materials and resources', 'health' and 'individuals and families'. Study within the latter two should lead pupils into a consideration of some of the 'material needs of man' (characteristic 1) and decisions about how people's well-being can be promoted. That such studies could lead, in some circumstances, to technological activity designed to fulfil the identified needs is also apparent.

At least one course topic, and in practice probably two, will concentrate on 'materials and resources'. Within this context there is scope for the 'design, production and use of artefacts, systems and ideas', for looking at ways of 'adapting the environment' and for considering 'efficiency' in the use of energy, materials, labour and money. Whether these opportunities are taken up and exploited to their full potential remains to be seen. Some of this context's contribution would probably be indirect or incidental. Much of the relevant knowledge which pupils will acquire about foods, dietary requirements, equipment, fabrics or energy sources in the normal course of home economics lessons could contribute to their 'technological awareness' depending on how it was presented. Such knowledge, along with the skills he or she develops, would be part of each pupil's 'resources' with which they may then tackle 'technological' tasks (Black and Harrison, 1985). During a typical Standard Grade course one would also expect pupils to use the latest in kitchen and household equipment while pursuing basically traditional home economics tasks. In other words, pupils would have opportunities to develop their familiarity with some 'technological applications'.

In the 'handling information' element of the course it seems more than likely that there should

also be opportunities for pupils to become familiar with the use of computers and data bases, as well as with other forms of information retrieval.

The third, and internally assessed, element of 'practical and organisational skills' could be a major source of home economics' contribution to the Technological Activities and Application mode at this stage. Planning and carrying out a course of action using a repertoire of practical skills, and evaluating that course of action once it is complete, are related directly to many of the definitions of technological activity collected in Appendix 1. The contexts within which pupils will practise and develop their competence in these skills can be derived from the three contexts for learning already mentioned. 'Health' clearly relates to 'the material needs of man' as does 'individuals and families', while knowledge of 'materials and resources' is necessary to plan suitable solutions to the problems posed in the other two. Although the emphasis in this element is on practical activity, it is not clear how much of that activity will take the form of open-ended problem solving. It is a place where such activity could conveniently occur, but the evidence so far (see Section 4) is that most practical activities are prescribed and pupils have to operate within fairly narrow confines. Perhaps as home economics teachers become more familar with Standard Grade and with the demands of introducing technological activities into their classrooms, they will be able to to adopt more flexible and open-ended approaches. The PRISME model of the design process has been adopted by some home economists in Scotland and pupil materials based on it have been prepared. There is a tendency however for the problems to be framed in terms of the expected outcome rather than to be truly open-ended.

Throughout the Standard Grade course, although the emphasis is placed on 'skills and processes', it is clear that these are underpinned by the 'knowledge and understanding' element within which pupils could have access to a range of information relating to technology. In other words their 'technological awareness' would be enhanced.

While this format of skills and contexts *can* lend itself easily to a technological interpretation, it seems probable that some teachers will continue to address the content in more traditional ways unless clear indications are given of *how* they should approach Standard Grade to give pupils greater access to the Technological Activities and Applications mode.

The *Arrangements* for the new Higher examination in home economics state the following:

> the course is concerned with the management of resources to meet these needs [for food, clothing, shelter, dependence on other people].
> Resource management involves [making] choices and decisions using particular knowledge and skills. These choices can be complex [...] influenced by a wide range of factors. These factors and their interaction have a direct bearing on resource management and they have been identified as the contexts for learning [... which] are presented in four groups as follows, reflecting the effect on choices [...] in the resource management of :
>
> social and economic factors;
> technological developments;
> marketing techniques and consumer protection;
> facts, concepts and principles.

Having a context which specifically relates to the effect of 'technological developments' on the choices which we all have to make immediately highlights the contribution which may be made to pupils' experience of the Technological Activities and Applications mode by a study of Higher home economics. However other aspects of this description also point out the Higher course's potential as a vehicle for technological understanding. A key phrase to pick out which relates to some of our five defining characteristics is 'management of resources to meet these needs [for food, clothing, shelter]'.

Although there is no specific reference to 'adapting the environment' (characteristic 3), by inference many of the tasks which pupils undertake could be interpreted in this way. The new Higher course comprises two topics and an individual study. To what extent there will be opportunities for 'technological activities' within the course will depend, in part, on the subject chosen for the individual study. The first topic is to be designed to allow 'candidates to make a general appraisal of the needs of individuals and families in relation to materials and resources in the home' (SEB,

1987g, p 13), which clearly relates to the first defining characteristic of technology. It is only after needs have been identified that pupils can set about meeting them - using the knowledge and skills which they have acquired to produce acceptable solutions. Depending on whether these activities were open-ended or not we could see this opportunity contributing to either characteristic 2 or 4.

Increasingly schools are using some SCOTVEC modules as part of the courses which they organise for senior pupils. We will look at their contribution in more detail in Section 4 but some of the modules, which are of a practical nature and vocationally orientated, could play a part in introducing more technological activities and applications into home economics classrooms. Some schools which have been involved in TVEI have taken advantage of the scheme to acquire modern technological equipment with quite specialist applications within the broad area of home economics (eg computer-aided design for textiles, computer control for looms, knitting machines, use of computer programs for the study of nutrition).

The extent to which individual home economics departments offer pupils opportunities to experience the Technological Activities and Applications mode will depend on how the staff interpret the various sets of course objectives. We suggest that it might be profitable, in relation to course planning, if teachers were to draw up a series of grids on which they match the course objectives against the defining characteristics of technology in order to decide where technological activities and applications might most appropriately be slotted into their courses. (See Appendix 4 for some ideas).

'Technology is only a part of home economics' (Thorne, 1988).

Finally, we feel that it is important to note that a number of contributions to the debate on the recent liberation of the subject have recommended exercising a degree of caution. Scriven (1988) warns against bending over backwards to accommodate technological activities in home economics lessons. Myers (1987) suggested that home economics will now have to 'argue for its crumb - for some share of the technology slice'. She points out the danger that 'by flying the technology kite home economists will lose proper acknowledgement of the structured need for home and family life education'. Other writers (Thorne, 1988, Phillingham, 1987) have claimed that there is a risk that if the profession does not defend the subject's integrity and useful contribution to 'relevant' education for the next century, other subjects, recognising the value of its content, will 'poach' and use it for 'exemplar material' in their own subjects.

Part 4: Technology in home economics: examples of practice

Introduction

Articles in home economics (eg *Modus*), and more general journals (eg *TES, Educational Computing*) provide us with examples of how home economists are introducing a technological approach into their subject. Other published sources provide additional examples. Classroom materials developed by education authorities and others are another source of suggestions. Some of these are based on the PRISME model. Additionally we have received information about current developments by making direct contact by letter and telephone with those involved. There is also scope for introducing a technological approach into home economics using 16+ modules. We will take each category in turn and list the examples found with brief annotations.

Journal Articles

(i) ANON (1987). Home economics and the GCSE. *SEC Newsletter* 6, Summer, p6.

This article stated that

> In home economics the National Criteria are framed in such a way as to ensure considerable freedom and the opportunity for curricular development. Stemming from them there are important implications for syllabus development, teaching and assessment.

It stressed the importance of an integrated approach with a

> focus on an investigational approach in which problem solving, the use of design briefs, research projects and construction of products are all part of the subject.

Although the inclusion of a technological approach is implicit rather than explicit, later references to psychomotor and technological skills suggest that there is an intention that GCSE home economics courses will embody something of the technological mode of learning.

(ii) BAILEY, S. (1984). Microchips with everything. *Modus*, 2(1), pp28-29.

The author suggests ways in which the computer could enhance pupils' learning in home economics classes. Specific mention was made of the use of the computer for quickly completing tedious calculations in, for instance, nutritional analysis. Access to a wide range of data files is also to be encouraged. Some pupils might benefit from programmed learning, especially systems which have praise, prompts and remedial loops built into them, but as these are designed for individual use there is not much use made of them yet, as home economics departments rarely have access to sufficient microcomputers. Another use to which computers with graphics packages may be put is the design of room layouts. Simulation exercises also have potential.

(iii) CAY, M.C. (1984). Decisions and choices. *TES*, 15/6/1984.

'The importance of including investigations in home economics courses', was stressed in this article.

(iv) CROCKETT, J. (1982). A goldmine of ideas. *TES*, 18/6/1982.

The value of home economics in encouraging 'problem solving/decision making', is put forward.

(v) DAVIES, V. and MANSELL, S. (1987). Textile technology. *TES*, 20/2/1987.

The authors report on a textile scheme being piloted in Devon schools. The course is called 'textile technology' to distinguish it from an art-based approach to creative textile work but the authors stress that it should complement the latter, not replace it. They believe that they are 'teaching on a small scale how mass-produced clothes are achieved'. This would seem to be contributing to raising awareness of technological applications. The course is, however, 'experiential' and relies on 'resource-based learning' as well as visits to factories, so there are aspects of 'technological activity' involved as well. There is 'high motivation' among the pupils, some of whom may seek employment in the garment trade, and a feeling of 'peer group responsibility' is encouraged'.

> The whole ambience is design process orientated from the need to research for solutions, to making/doing and evaluation: the very stance our whole society requires for modern living. Spoon-fed facts are at an absolute minimum and skills are taught as the need arises - young people can see the relevance of these sessions and accept them with good grace as giving them the tools to proceed with their major tasks of a practical nature.

(vi) FINCH, I. (1987). Investigation and GCSE : searching questions. *TES*, 20/2/1987.

Finch claims that 'investigatory work is possibly the biggest innovation in new Home Economics GCSE'. She further makes the point that the role of investigations is to 'help pupils to make a practical decision or choice or solve a practical problem'. She differentiates between first and second hand investigations, the latter using reference material and similar sources, and also between investigation as a learning method and as an assessment instrument. She stresses that it is not easy to devise really interesting investigations and briefs when pupils have little knowledge and few skills in the early secondary years. She makes a plea that good briefs 'should be treasured and disseminated'.

(vii) FISK, B. (1981). To the rescue of quality control. *Educational Computing*, 2(a), pp21-22.

Young people's need to be familiar with micro-computers is identified and it is suggested that home economics is a medium through which they can learn. Trainee home economists at the Polytechnic of North London were, even then, given the opportunities to acquire the necessary skills and knowledge. Today one would expect that home economics students in many more institutions are able to make use of similar opportunities.

(viii) GOLIGHTLY, L. (1981). An ideal medium for teaching micro-electronics. *Educational Computing*, 2(a).

The author expressed fears that 'few home economists will have grasped the significance of developments in micro-electronics'. She thought this a pity because they have 'the potential' to be 'innovators of further developments'. She believed that because of its 'applied technological nature' home economics would be affected 'at least the same and probably more than any other discipline'. Drawing on her earlier research (Matthews and Golightly, 1981) she opined that

> home economics is concerned with domestic products and with all aspects of their development. There is, therefore a two-fold consideration in the way in which microelectronics affects the home economist.
>
> On the one hand there is the effect on teaching and learning techniques and on the other the feedback effect from developments in domestic products which home economics will need to understand and be able to influence.

(ix) HODGKINSON (1984). Micro-diet: a guide to computer aided learning of nutrition. *Modus*, 2(1), pp24-25.

Nutrition is put forward as a suitable context in which pupils may use micro-computers within home economics. The author points out, however, that the use of nutrition and diet

programmes, while valuable, should not be seen as the whole of pupils' education in this topic.

(x) JONES, B. (1987). From needlework to textile design: a change of image. *TES*, 20/2/1987, p40.

The author documents a development which capitalised on TVEI to buy industrial machinery and hire an outside 'expert' for two sessions each week to launch this new 'textile design' course. A need for 'skilled machinists' was recognised in the local community and it was decided to develop a course which, it was hoped, would arouse pupils' interest in textiles, show them something of the variety of jobs available at all levels in the industry and encourage the clothing industry to present a 'better image of itself as an employer'. The course has been a success, though there have been some problems with getting industrial quality supplies at short notice.

(xi) PARRY, J. and DOVEY, P.C. (1986). Software review: two more data files to use with the information retrieval packages SCAN or QUEST. *Modus*, 4(6).

The two data files reviewed are Home Accident Data and Fire Data. A number of ways in which these, along with an earlier file on Electrical Equipment, could be used are suggested. The data files are available for use with BBC machines.

(xii) SMITH, J.B. (1988). Reconceptualising the home economics curriculum development. *Yearbook for Supervision and Curriculum Development*, pp181-186.

A major American project, supported by the Home Economics Division of the American Vocational Association, the American Home Economics Association and the Home Economics Education Association, which has a remit to 'reconceptualise the home economics curriculum at the secondary level', is described. A report will be published in 1988, setting out the concepts that are distinctive, but not necessarily exclusive to the high school home economics curriculum. It is suggested that if young people are to be equipped to operate in the next century they need 'thinking and reasoning skills' rather than a lot of facts which will quickly become redundant. Home economics is advocated as a discipline that provides students with opportunities to develop such skills.

(xiii) WATSON, J. (1981). Drawing the strings together. *Educational Computing*, 2(a), pp20-21.

The author reported on the in-service courses which ILEA was already running for home economics teachers in relation to the use of computers in their subject. Referring to the Hertfordshire Diet Programme (developed by Down, Grove and Lawrence) she remarked that it 'takes the pain out of dietary analysis and creates interest in finding out about the nutrients in food'.

She also recommended that home economics teachers use two programs developed by Edward Arnold - Human Energy Expenditure and Home Heating, suggesting that, using the latter, pupils will quickly be able to calculate heating costs. ILEA teachers were reluctant to use computers at first but the in-service course was designed in three phases: learning about computers; writing programs; dissemination of information, updating and augmenting libraries of programs.

(xiv) WILLIAMS, H. (1986). Change of direction. *Modus*, 4(8), November.

Having opined that the primary aim of teaching home economics is 'to help prepare boys and girls for aspects of everyday life and adult responsibilities', the author suggests that 'design education' is one way to achieve these ends. She reports on a unit of work in textiles (16x70 minutes) for 12-14 year olds which focuses on design problems related to daily life and uses the PRISMA model which is basically the same as PRISME (for Evaluation read Assessment). The unit is 'child-centred' because it is individual: although pupils may begin with the same problem - make a pencil case or design and make a sportswear garment - the solutions may be very different. It is often appropriate to begin at the end, as it were, with an idea of what the finished

product will look like and then work out how to achieve it. Patterns are drafted from the final drawing, seam allowances and turnings added and a paper mock-up made. If it works, a proper pattern will be drafted and the fabric cut. This is a very different approach from the traditional one of using a commercially produced pattern and following it step by step.

Other published sources

(i) BLACK, P., HARRISON, G., HILL, A. and MURRAY, R. (1988). *Technology Education Project 1985-1988: Report:* London and Nottingham: Kings College and Trent Polytechnic.

The Technology Education Project saw technology's role as 'exploitation of all knowledge (both scientific and non-scientific) for creative and productive activities in the interests of society' (p5). It is perhaps worth noting that there were no home economists on the project's consultative committee of twenty-four! Although 'coherence across the curriculum' is included in the proposed 'seven-point plan for technology' there are no specific references to the roles to be played by individual school subjects. There is, however, mention (p21) of 'textiles and food' and a diagram (p14) which makes specific reference to the contributary role of home economics as a school subject in relation to a number of precise technological learning experiences. These include exploration of natural dyes, recommendations about a change of school site and designing and making a hypothermia avoidance kit for old people.

(ii) BUTTS, D. and TURNER, E. (1988). *The National Evaluation of TRIST in Scotland: part II*. A quartet of case studies. HMSO.

One case study reports an authority's TRIST programme which placed the emphasis on 'new technology' because 'the teachers are terrified of new technology. We needed to enhance their confidence' (p6). Thirty-six home economics teachers from seventeen different schools took advantage of the course run specifically for them (p9).

Another case study includes a report on a 'computer skills for home economics teachers' course held in another region. This course, held over two weekends concentrated on providing home economics staff with 'the skills to enable them to use a computer as a management tool'. The teachers involved were 'delighted with the opportunity of acquiring new "support skills",' and asked for more follow-up sessions and better access to computers (p50).

Other authorities also ran TRIST courses for home economics teachers - in some cases these were 'technology' orientated; in others 'design' was the focus.

(iii) NATHE (1988). *The Place of Home Economics in Technology: submission to the Design and Technology Working Group by the National Association of Teachers of Home Economics,* London: NATHE.

In addition to highlighting the role home economics can play in technology education some 'exemplary materials' are provided as 'evidence of ways in which tasks can be undertaken, both in home economics and across the curriculum, and which embody a range of 'technological activities' (p2). The 'activities' illustrated are:

alternative sources of energy;
clothing and equipment to protect the young from the cold;
healthy eating: designing a 'better' burger;
designing, making and marketing a new food;
a prototype for a fast food outlet.

Also included is a blank flow chart which can be used for developing similar technological activities.

(iv) THE OPEN UNIVERSITY (1981). *Living with technology: A foundation course T101 Block 1: Home.* Milton Keynes: Open University Press.

With its focus on the home there are many ideas in this document which could be developed by home economics teachers. Particularly interesting is a 'spray diagram' showing the 'infrastructure or network of dependencies' surrounding a home (p96).

Materials produced by Scottish education authorities

(i) Central Region

A working party produced a set of sample materials to support home economics teachers who are developing Standard Grade courses to meet the needs of their own pupils. These materials were disseminated more widely by SCCC on behalf of the CSG for home economics. Supportive pupil materials for Topics 1-3, *Finding the way, Let's look* and *Let's find out* were developed elsewhere. Similar supportive materials for Topics 4 and 5, *Do we know?* and *Let's look outside* are being developed in the Region and will be available nationally in the near future. Some of the topics and units have a definite technological slant especially at the S4 stage when, it is felt, the pupils are more able to cope with the PRISME model.

A sample working brief is supplied in the third unit of Topic 4, which is entitled *About fabric*. The topic objective, which relates to Course Objective No 4 (see Appendix 2) is:

> select a suitable fabric for a given specification.

Three 'graded' tasks are outlined:

Levels 6/5	Design a wall hanging for a child's bedroom;
Levels 4/3	Design a sports bag;
Levels 2/1	Design a body warmer for an elderly house-bound person.

Unless these items are actually *manufactured*, as well as designed, this activity would not meet our definition of technological activity. Similarly the PRISME model is exemplified in relation to fabric care as follows:

Problem:	Dirty clothes
Restrictions:	Stains, type of fabric, equipment available, skill of operator
Investigations:	Identification of fibres, effect of chemicals on fibres, application of HLCC
Solution:	Select suitable chemical for type of stain/fibre
Manufacture:	Nil
Evaluation:	Clean clothes, undamaged fibre.

(Topic 4, Unit 4, p25)

This task clearly involves pupils in 'awareness' of and 'application' of technological equipment although it does not involve 'technological activity' in the sense of 'designing and making'. As the PRISME model was developed to facilitate the design process it does not seem totally appropriate to apply it to a process which involves no manufacture.

Other applications of the PRISME model are found in Topic 5, Unit 3 *Make an article for your 'own place'* which does seem to fit our 'technological activity' definition, and Topic 5, Unit 4 *Select methods of dealing with holiday laundry*, which appears not to fit. That these are useful activities in a home economics course is not in doubt. Such laundry activities do require pupils to have 'technological knowledge' (ie 'awareness') and to be able to 'apply' it appropriately but whether they constitute 'technological activity', in the sense in which we have defined the term, is another question.

Central Region is also committed to the use of computers to control equipment used in home economics classes such as knitting machines (especially in the Hillfoots area where the knitting

industry is still an important employer) and looms.

(ii) Grampian Region

This Region has launched an in-service programme to help its home economics teachers adopt a more technologically orientated approach. An in-service workshop on 'technological awareness' was held at Dyce Academy on September 27, 1988 and reportedly 'worked very well'. Materials to support this in-service session are available. Additionally, a Development Officer has prepared a package entitled *Increasing technological awareness in home economics*.

A six-day course called *Technology and home economics* started in January 1989. Approximately thirty teachers are attending this course which focuses on technology and micro-electronic applications in the field of home economics.

(iii) Strathclyde Region

Recently a set of well produced teachers' notes and pupil worksheets has been issued for a Standard Grade topic on *Problem Solving*. Based on the PRISME model, the pupil sheets lead the children through a logical sequence of problem solving activities. As we indicated earlier (p15) some problems posed when the PRISME model is followed are framed in terms of the expected solution rather than as truly open-ended problems to be solved. There are examples of both in this topic.

> Design a suitable storage system for your Home Economics Units which will be secure and organised.
>
> Your family has won a microwave oven in a newspaper competition but there is very little money available to purchase manufactured cookware dishes.
>
> Finance is required for special needs of a community group.
>
> The school snack bar is being redecorated and will not be opened for several weeks. Select a series of simple meals which would be suitable as a substitute during this time.

The separate units are entitled: *Keep it tidy, Economy plus, Friends and neighbours* and *Recipe roundup*, indicating a close adherence to traditional home economics content with which teachers will, no doubt, feel familiar. This is probably a necessary first step when getting teachers to adopt a new approach. Additional useful information in the teachers' notes includes reference to the Standard Grade element, course objectives and 'essential knowledge' being covered by each activity as well as suggested resources, pupil activities and teaching approaches.

(iv) Strathclyde Region, Ayr Division

Ayr Division has produced pupil and teacher materials for a Standard Grade topic called *Is it worth it?* for which the major context is 'materials and resources'. The four units are: *A testing time; Shopping around; Beating the bugs* and *Designer made*.

Although only the fourth of these may be said to involve 'technological activities' in the sense that pupils are actually expected to design, make and evaluate an item, within the context of 'children's toys', some aspects of the others would also contribute to their 'technological awareness' and 'knowledge of technological applications'. For instance, *A testing time* focuses on kitchen appliances: having assembled and used them pupils are expected to evaluate them. These tasks involve them in *using* equipment such as a food mixer, pressure cooker or deep fat frier. In *Shopping around* the pupils are to 'select electrical goods for given situations'. In order to do that they need to apply their existing knowledge of equipment. Another aspect of this unit relates to safety which has clear links with 'technology'. *Beating the bugs* involves pupils in applying scientific knowledge about micro-organisms which cause food spoilage to the tasks of safe food storage and preservation.

(v) Tayside Region

This Region has issued a similar package called *Technological activities for Standard Grade Home Economics*. Developed by the TVEI Staff Tutor (Home Economics) and the Curriculum Development Team, the package contains an item bank of technological activities, with two of them fully developed for use in a Standard Grade course. The aims of this package are:

> to encourage the use of practical problem solving activities and technological activities
> to develop investigative skills.

Again the approach is based on PRISME. The introduction states that technological activities should:

> be concerned with controlling or modifying the environment to meet a definite human need and engage pupils actively in designing and making an artefact or working system to satisfy that need.

The point is made that in technological activities in the classroom it may not always be necessary to include all the stages of PRISME. Problems are suggested within the Units: *Fortune raising; Gift shop; Keep it fresh; Washday blues; Tidy it and Long distance shopping*. Again some of the problems are open-ended while in others the solution is prescribed eg to prepare an item for sale to raise funds.

Activities for the most part reported to us either personally or by telephone

(i) Scotland

(a) Lothian Region

Lothian also reports in-service activity. By early 1989 all of the region's secondary schools have had access to a day-long workshop on *Technological activity in home economics* which puts teachers through the process so that they themselves experience technological activity. Additionally a brief was prepared for a six session workshop course for 24 teachers, run by Queen Margaret College, beginning in October, 1988.

(b) The Queen's College, Glasgow

In the Spring and Summer of 1988, The Queen's College, Glasgow, in conjunction with the Institute of Home Economics, organised a series of 'taster' seminars in *Health education, Issues in science, Information technology, Business enterprise, Manufacturing skills* for home economists working in education, industry, commerce, health and welfare. As a consequence of these successful seminars the college has applied for, and received, funds through SED/ PICKUP to develop a programme of updating courses for home economists.

The thrust of the college's BA *Home Economics* degree course is the 'management of finite resources within the home and the relationship between the home and the wider social and economic environment'. (Campbell, 1988). In the first year of the course the emphasis is on the family, while in the second opportunities are provided for students to study the interface between consumers and producers. Final year studies focus on the wider commercial environment. The emphasis would appear to be more on social and commercial aspects than on technology.

(c) Queen Margaret College, Edinburgh

There is a new BA degree course in *Applied Consumer Studies* (ACS). It is interesting to note that the college, in naming its new course, has moved towards consumer studies and not technology. It sees ACS as 'a branch of economics' (Murray, 1988). The home economics specialism of the ACS course was, at the time the current prospectus was written, under consideration by GTC as an entry qualification for teacher training. The headings given for the various parts of the course are, however, so general that it is not possible to speculate on what they cover. There is clear scope, however, for including a technological perspective within

sections entitled 'product studies', 'information studies', 'household studies', 'food studies', 'housing studies' and 'textile studies'. Whether these do, in fact, have a technological slant will probably depend on how the subject develops in Scotland over the next few years.

(d) Robert Gordon's Institute of Technology (RGIT), Aberdeen

Home economics students study for a BSc degree in *Food, textiles and consumer studies*. At RGIT there is a tradition of 'commitment to vocational education' and courses have always contained 'a strong and purposeful practical element and the graduates are "doers" as well as "thinkers"'. (Bennett, 1988). This author makes the point that, although the breadth of opportunity in terms of careers for graduates is a great strength, it 'does rather complicate the ongoing search for a clear identity for the subject'. Currently it appears that this 'identity' does not include technology.

(e) National Course, February, 1989

This National Course relates to the revised Higher in home economics. One contribution (by Allison Long, Moray House College, and Christine Pollock, Adviser, Ayr Division) will deal with the role of technological activity in the new course. They propose to use a workshop format to introduce participants to Black and Harrison's Task Action Capability model of technology education (see Part 1). Participants will be expected to relate this model to the technological context outlined in the *Arrangements* for the new Higher (SEB, 1987g, p10). They intend to point out that there are applications other than those mentioned in the *Arrangements* (major equipment; fabrics for clothing; food processing to improve keeping qualities). In addition to the workshop based on the TAC model they will be providing access to hardware demonstrating, for example, 'computer-aided design', 'computers as control mechanisms (eg for knitting machines, looms), databases'.

They envisage home economics as a 'vehicle' by which pupils can be introduced to the wider themes of technological education but warn against 'going overboard' by trying to incorporate technological activity into every aspect of the subject.

(f) Strathclyde Region, Ayr Division

This Authority sees the thrust of its in-service programme in relation to technology/technological activity as being two-fold:

> 1. Getting teachers familiar with and able to use hardware;
> 2. Getting teachers to change their teaching approach to involve more 'problem solving' and 'technological activity'.

The first is being tackled through TVEI where, thus far, eight days have been devoted to 'hardware familiarisation'. The hardware used includes computers, especially in their role as control mechanisms for other equipment - for example, a software package is available for use with BBC microcomputers to control electronic knitting machines; computers are used to control video cameras and digitisers and one school is piloting the use of interactive video. Another is experimenting with a design course using an Archimedes computer with a full colour printer and plotter. Pupils are aiming at SCOTVEC module certification in *Design and make* 64805 and/or *Design studies* 64804 within TVEI. These two modules were originally produced for engineering but the descriptors and learning outcomes are sufficiently open-ended to be capable of interpretation within a fabric design context, and SCOTVEC has agreed to certificate those pupils who achieve the module's learning outcomes. In Ayr Division, home economics is included in the core TVEI programme in all four schools involved.

(ii) England and Wales

(a) Bedfordshire

Working under the umbrella of TVEI Extension, with the guarantee that all pupils will experience 'technology across the curriculum', the developers started from an existing strong commitment to Design and Technology and built on it using a range of subjects. Having defined a core of skills, knowledge and values which would come mainly from science, craft, design and technology, home economics and the humanities but also including religious education (moral values) and business studies (economic values), a research programme was carried out in 13 schools to analyse teaching provision and curriculum to find where technological processes fitted in. It was found that *all* subjects *could* contribute but not all of them did. A ring binder providing examples of the technological process was produced. An in-depth analysis followed of the curriculum diet of two schools. A 'core' has been defined and examples of three delivery models (in timetable, cross-curricular and group enterprise project - with suspended timetable) provided. From 1989 *all* schools will have a core curriculum containing technology as exemplified in the documents. To ensure wider dissemination/ follow-up each school has nominated a Technology Across the Curriculum Co-ordinator to liaise with senior management and to monitor/manage technology. In-service support is available to local consortia of schools. The package is available at a cost of £15. (Bedfordshire Education Service, 1987 a, b and ND).

Additionally a Mode 3 GCSE course has been developed in the county and been approved by the Midlands Examining Group (MEG) for first examination in 1991 (Subject to SEAC approval).

This is a cross-curricular course (called *Technology across the curriculum*) involving technology in a range of subjects. It has been mainly developed from TVEI Extension work, outlined above, by Stuart Taylor, professional development tutor based at the TVEI Unit, County Hall, Bedford. Pupils will submit pieces of work from craft, design and technology, home economics and science for this cross-curricular GCSE examination provided that they meet the criteria for technology contained in the GCSE syllabus which derives from the Bedfordshire TVEI Extension plan.

(b) Essex

Gwyneth Street, Home Economics Advisory Teacher in Essex, who is based at the Meadgate Curriculum Development Centre, Chelmsford, has produced a home economics module called *Coverall - achieving design and technological capabilities through textile studies*. It is concerned with designing and making protective clothing for children at play school. The module, designed for fourteen year olds, provides a 9-week teaching programme (9 x 80 minutes). The teachers' guide contains all the information required to run the module for twenty children. Copies are available from Mrs Street at a cost of £10 (including p and p). Requests should be accompanied by cheques made payable to Essex County Council.

(c) Gloucestershire - Technology Through Home Economics - The Seven South West Countries (JSA)

Gloucestershire is the host authority for this major developmental project funded from April 1988, by the Training Commission for three years. Avon, Cornwall, Devon, Dorset, Gloucestershire, Somerset and Wiltshire LEA's are involved directly in the Project directed by Irena Olejnikowna. Each county has an action team of at least seven members including the home economics adviser, classroom teachers and, wherever suitable, representatives from craft, design and technology, information technology or science as they are most interested in promoting cross-curricular links in all their work. The Project is developing management (eg strategies and INSET) and classroom resources for the teaching of the *process* of design and technology thus emphasising the home economics/art and design/craft, design and technology/ science axis required in schools and colleges to enable all students to receive proper training in design and technological capability.

(d) Hampshire

A group of teachers and advisory teachers representing the 5-19 age range and cross-curricular subject areas including home economics, are part of Hampshire's *Technology Education Project* led by Richard Mitchell. The group has been working on both philosophy and practice documents for schools with exemplar teaching strategies and materials since mid 1987.

Additionally, the *Hampshire Modular Scheme* has been piloting a Mode 3 Technology/Craft Design and Technology modular syllabus through the Southern Examining Group, since September, 1988. A team of home economics teachers is writing modular syllabi for *Home Economics - Food* and *Home Economics - Textiles*, with emphasis on technology and technological processes. It is hoped to start the courses in September 1989. The five modules will follow the same format as the craft, design and technology syllabus, enabling cross-curricular links to be made as appropriate.

(e) Kent

Sue Dunn, teacher/adviser for home economics for the County Council, has produced, in conjunction with Christchurch College, Canterbury, a *Certificate in Curriculum Development for Home Economics Teachers in Secondary Schools* (20 days). This course explores issues within design and technology relating to home economics through some practical activities and the cross-curricular implications for the subject. The course which will be run during the Autumn term, 1989, comprises three inter-linked units of study:

> Home economics: changing approaches;
> implications of new initiatives;
> development, management and evaluation of learning resources.

In May, 1988, the Authority appointed an inspector for technology 'in all its forms'. It is hoped to carry out a 'technology audit' of all Kent schools. This project is at an early stage yet but it is hoped that before the end of the 1988-9 session they will have been able to disseminate information in all six areas of the county.

During the 1988-9 session the in-service programme in design and technology has been very productive. Some highly successful collaborative links have been formed with science, craft, design and technology and art and design with some interesting curriculum developments taking place in schools.

(f) London, King's College, University of London

Robin Murray, at the Centre for Educational Studies, was involved with the *Technology Education Project* which has recently been completed. He reports that work began in September, 1988 on a three year pilot scheme which is looking at 'multi-certificated inter-disciplinary course work within GCSE'. Schools in ten authorities throughout England are involved. Technology is being viewed as 'cross subject', which poses problems for assessment at GCSE. The project will consider the assessment of tasks in technology according to the criteria of the contributing subjects.

(g) Nottingham, Trent Polytechnic

Currently the Department of Secondary and Tertiary Education is offering a series of 12-day *Technology in Home Economics* courses in Nottinghamshire and neighbouring LEAs. The course highlights problem-solving, management and resources and expects teachers to plan and implement a technological development programme for their schools. This course is part of an expanding programme preparing teachers to manage design and technology in the National Curriculum and is serviced by resident staff engaged in curriculum development at a national level. (Contact: Brenda Smith - 0602 : 418248 ext 3377).

Additionally, other departments of the Polytechnic are involved in activities which may be of interest to home economists seeking to introduce a technological element into their courses. The

Trent International Centre for School Technology (TICST), established in April 1987, runs LEA-based INSET programmes, INSET courses at TICST itself and special courses for advisers and lecturers. (Contact: G. Shillito - 0602 : 418248 etc 2101).

Also based at Trent is the TVEI Consultancy in Science and Technology Education. The Consultancy provides support to schools, LEAs and TVEI during the Extension phase. A *Technology Toolkit*, developed by the Consultancy, provides a means of planning and monitoring, through theoretical and operational models, technology education within schools. (Contact: Prof. G.B. Harrison - 0602 : 418248 ext 2155).

The TVEI Curriculum Database for England and Wales is maintained at Trent. The database has collected information and has monitored developments in school curricula during the Pilot Phase of TVEI. (Contact: Prof. G.B. Harrison - 0602 : 418248 ext 2020.

(h) Sheffield

Pat Waring at the City Polytechnic, who was previously involved in a project looking at *Teaching home economics in secondary schools, past and present*, has begun a new three year (1989-92) project *Technology and home economics in the school curriculum*. The project, which has the services of a seconded teacher as research officer, aims to collate and draw together specific examples of technology in home economics. The project is sponsored by the All Saints Educational Trust.

(i) Shropshire

Another Mode 3 GCSE course, (approved by Midlands Examining Group - MEG) has been produced here. The title is *Introduction to catering*. It is totally coursework assessed. Additionally, there is also a Mode 3, GCSE course (also approved by MEG.) called *Technology for all* which includes modules on food technology and textile technology as well as household technology and bio-technology, and other modules across a variety of curriculum areas.

(j) Wales

Based in Cardiff a Steering Group on *Technology across the Curriculum* has been established to discuss the possibilities of a GCSE Mode 1 examination. Its first meeting was on September 27 1988.

National Certificate Modules

It is not easy to sum up what is going on in the National Certificate (NC) with regard to home economics and technology - too much depends on the composition and delivery of particular programmes (which may vary greatly) to make any general statements about it. However, it is possible to look at individual modules as examples of what is happening.

A home economics programme could be constructed using modules from many different parts of the catalogue. There is, in fact, only one module in the catalogue specifically designated as home economics - *69020 Home Economics*. There are, however, modules in the Industrial Processing area which are concerned with food processing and fabric skills. The third major area would include modules from Caring Skills, though these are much less clearly related to 'technology', as are those individual modules from such areas as Personal and Social Development which could be included in a home economics programme.

Given that the National Certificate is a primarily vocational initiative, it is not surprising that there are plenty of examples of the 'awareness' and 'application' aspects of technology education in many modules. Most relevant modules in the Industrial Processing area are, as the name implies, geared towards the needs of the mass market food and fabric industries and, as such, may not be strictly appropriate for delivery in schools.

However, one should point out how much the 'technological activity'/'problem solving'/

'design' ethos is present in the National Certificate. Module 69020 *Home Economics* is particularly interesting. It is worth comparing its learning outcomes with those from two other modules from the Engineering area to see how much they have in common. (See Table 3).

It is clear how similar the approach is in each of these modules. Each takes a 'problem solving' approach and each is relatively context-independent. Thus it should not be too much of a surprise to discover that module 64805 (and its companion module 64804: *Design Studies*) has, in fact, been used as part of a home economics programme. (See page 22).

Table 3 : Learning Outcomes for three NC Modules

69020 Home Economics	64805 Design and Make	64818 Applied Technology 1
The student should: 1. for a given task or brief, analyse the problem and identify a number of possible strategies for dealing with it; 2. carry out the practical investigation; 3. evaluate and assess the end result of the investigation.	The student should: 1. know the purpose of a clear design brief; 2. select and use relevant technical information for a design project; 3. plan the manufacture of the product; 4. make/assemble, test and if necessary modify the design; 5. comply with regulations and procedures and use safe working practices specified for equipment and working areas.	The student should: 1. prepare a brief for the solution of a technological problem relating to the programme of modules being undertaken; 2. prepare, in outline, and analyse a range of strategies for a solution; 3. utilise one of the strategies to design and develop a solution; 4. evaluate the solution.

Elements of the 'problem solving' approach can be found in many other modules applicable to home economics programmes. In a specialist module such as 67608: *Meal and Menu Planning* the emphasis, as revealed by the learning outcomes, is on the restrictions within which the student must operate:

The student should:

1. know and apply cost constraints of operation;
2. know and use the principles of meal/menu planning within operational constraints;
3. state recommendations for decoration and presentation of dishes;
4. identify customer requirements in relation to market competitors.

In other cases the learning outcomes of the module reveal more features of the 'problem solving'/'design' approach, as in 77862: *Design and Manufacture of Light Clothing:*

The student should:

1. design a shirt and a blouse or dress;

2. select relevant technical information from the designs to produce 2 sample patterns;

3. test the designs, modify if necessary and make completed production patterns;

4. plan the manufacture of the garments;

5. manufacture a shirt and blouse or dress;

6. produce garment specification books.

Although in this case the problem (and its associated solution) is not completely 'open', in that it is substantively pre-determined as a certain type of clothing to be designed, there is a strong emphasis on operational and process planning. It would also be relatively easy to analyse these learning outcomes in terms of the PRISME model of the design process.

However, it should not be assumed that this approach is all-pervading in the NC modules. As an example of a module where the traditional craft skills approach is still very much in evidence it is possible to cite 67500 : *Food and Food Preparation:*

The student should:

1. identify foodstuffs as being in the raw, cooked or preserved state;

2. weigh and measure foods;

3. select and use cutting, shaping and mixing tools safely and hygienically;

4. perform manipulative skills associated with simple hand tools;

5. dismantle, clean and reassemble basic equipment;

6. follow oral instructions.

Part 5: The implications of placing home economics in the Technological Activities and Applications mode

The decision to place home economics within the recently designated mode of Technological Activities and Applications has a number of implications for individual teachers and for the profession as a whole. If the subject is to make a genuine and worthwhile contribution to the technological education of young people in Scottish secondary schools, most of the issues raised here will need to be addressed by the SED, the SEB, education authorities, teachers' organisations, the colleges and individual teachers.

The importance of developing an effective strategy should not be underestimated. Studies carried out by the SCRE TVEI Curriculum database team indicate that home economics shoulders a considerable burden in delivering the Technological Activities and Applications mode in Scottish schools. Analysis (Black, Malcolm and Zaklukiewicz, 1988) of the time spent by both 'TVEI' and 'non-TVEI' pupils in session 1985-86 (before the current CCC recommendations on balance had been conceived) on subjects which would now fall within the Technological Activities and Applications mode suggested that the 'average' pupil fell well within the minimum 5% suggested. It was clear that this was being achieved largely through the uptake of traditional subjects and that for girls, much of it through home economics. Analysis of the data for 1987-88 confirmed this pattern and indicated that about 80% of young people in the thirty Round Five TVEI schools (those that began TVEI in that session) were already spending at least 5% of their time in the Technological Activities and Applications mode and again much of this was accounted for by the 'traditional' curriculum. If the minimum can be achieved with such ease it may be appropriate to ask what impetus there will be to schools to make other than superficial changes to accommodate the new mode. Questions might equally be asked as to whether such an attitude would reflect the spirit of the CCC recommendation. If it does not the major responsibility for change will rest at least as much with subjects as it will with schools.

Changes to the teaching of home economics brought about by the introduction of Standard Grade, revision of the Higher, the advent of SCOTVEC courses and in some schools, involvement in TVEI means that some teachers of home economics have already espoused a more open-ended, problem-solving approach to the teaching of the subject which fits well with the definition of technology with which we have been working. It seems likely, however, that the extent to which these changes have been welcomed will vary considerably. But if the placing of home economics in the Technological Activities and Applications mode is to be successful and the subject is to fulfil its potential in this field, all classroom teachers will need to understand fully the implications of the change and be convinced that it is worthwhile.

The issue of how teachers, specifically home economics teachers, can be encouraged to adopt new approaches, content and assessment procedures, was explored in depth by the Assessment in Home Economics Research Project, based at Moray House College from 1982-87. In essence the researchers reported that change will only occur slowly and then only if teachers are convinced of its value, are 'involved' and receive plenty of the right kind of support (see Cumming *et al*, 1985, Long *et al*, 1987, Turner *et al*, 1988). This is not the place to rehearse all the arguments about the process of instituting innovations in education; suffice it to say that there is abundant evidence to suggest that if it is to be successful sufficient time, resources and support personnel must be made available to adopt a 'normative re-educative' innovation strategy rather than a 'power coercive' model (see Bennis, Benne and Chin, 1969; Havelock, 1969 and Bolam, 1975).

It would be naive to believe that home economics teachers are any different from others in resisting change - indeed there is evidence that they can be quite cynical about paying lip-service to a proposed innovation while carrying on much as before. Witness the teacher quoted by Cumming *et al*, (1985):

> Ladies, for all the new words in the Guidelines we'll go on doing what we've always done - baking scones and making garments - though we'll dress up our courses in the language they want. (p11)

In other words, in trying to bring about change one must be conscious of the danger of what Nisbet (1975) called 'innovation without change' (p2). So if the pitfalls that have been associated with many other innovations are not to occur again, how can the leaders of the profession ensure that *all* home economics teachers share their vision of the future of the subject and will help to bring it about?

The first task must be to make teachers familiar with the notions involved. Teachers need to have their awareness raised about what it means to adopt a technological approach to the teaching of home economics. It may be a truism to state that the role of technology in the subject and the contribution which it can make to pupils' overall technological education (not necessarily the same thing) ought to be clearly articulated in *all* official subject documents, but this is not the case currently, except for the *Arrangements* for the new Higher Grade examination. If the subject is to contribute meaningfully to the Technological Activities and Applications mode it may be necessary to review documents which preceded its introduction by the CCC; and that most importantly includes those relating to Standard Grade.

The mechanics of nurturing familiarity fall within the processes of staff training. Existing writing in this area suggests that this may not be a straightforward task. Golightly (1981), for example, feared that there may be such resistance from teachers of home economics to the move away from the overwhelming concentration on food that the potential of home economics 'for preparing young people to move in a different technological environment from the one they experience at present may be lost'. On the other hand there may also be a danger in going too far the other way. The placing of their subject in the Technological Activities and Applications mode may lead some teachers of home economics to try to justify its place there by dragging technology into all aspects of the subject. Scriven (1988) warns against such over-enthusiasm, pointing out that much of value in the subject may be lost if it concentrates solely on a technological approach. Nevertheless, home economics is in the Technological Activities and Applications mode and subject teachers will have to come to terms with this new situation. It would, however be a disservice to home economics teachers to tell them that they 'really do not need to worry because a lot of what they are doing already is technology' and that 'you can use a technological approach for everything in home economics'. If home economics is to make a significant contribution to the Technological Activities and Applications mode a different approach is needed and teachers must accept that. If this need is swept under the carpet things will go on much as before. While it is true that many of the traditional home economics activities - planning and preparing meals, designing and making fabric items - *can* provide the contexts within which pupils can develop technological skills, they will only do so if the approach to the tasks is fundamentally different from a traditional, didactic teaching style.

Once teachers have become familiar with what is involved in teaching 'technology' they will need practice. Clearly if home economics is to make a major contribution to technology education, which will involve re-designing courses and may involve some teachers in learning new skills, eg using a computer, a substantial in-service programme will be required. Some authorities have recognised this need and have begun such programmes but it will take time before teachers in all secondary schools have been involved. There may be other possible avenues and it might be worth noting that the Open University runs a course entitled *Living with Technology: a course for teachers* (ET217) which provides a general background in technology along with ideas about its role in schools (see Appendix 5 for details).

Once teachers have gained in confidence following their practice they will have to apply what they have learned in their own departments by devising suitable learning situations for their pupils. At this stage not only would suitable examples and reference material be useful to them as sources of ideas, but so too would a list of criteria by which to judge whether the chosen activities could indeed be considered as technology.

In summary then, considerable effort is required if home economics is to fulfil its potential role in the broader spectrum of technological education. It will not happen by itself. Look back to 1977 when Munn placed home economics in the scientific mode. Have home economics

courses become truly 'scientific' since then? They have not. Indeed there is very little reference to scientific knowledge, skills and methods in either Standard Grade home economics or the new Higher. The same thing could happen again. Those who wish home economics to play a major part in raising pupils' awareness of technological applications and to provide opportunities for them to experience technological activities should recognise what will be required if their wishes are to be achieved.

They will need to convince not only home economics teachers but also SED officials, education authority personnel, headteachers, and parents, amongst others, of their subject's unique contribution to technological education.

They will need to raise the level of awareness amongst the profession about what technology is and how pupils can be exposed to it in home economics classrooms, by disseminating explanatory and sample material to schools and supporting staff development activities.

They can write and rewrite curriculum and assessment documents so that the role and potential of technology within the subject is clearly explained to all home economics teachers.

They can provide a co-ordinated and extensive programme of in-service education to introduce home economics teachers to technological concepts and practices.

They can provide support material for teachers to encourage them to introduce technological activities into their lessons.

They can provide teachers with criteria which will help them to determine which activities really fit the technology definition. But they must also protect those other aspects of the subject which do not lend themselves to a technological approach, but which make a valuable contribution to pupils' overall education and which should not be lost.

They can provide teachers with a bibliography of helpful literature to support them in changing their practices.

APPENDIX 1

Definitions of technology

From *The Place of Technology in the Secondary Curriculum*, CCC, (1985). Appendix D, p33.

> Technology [is] a disciplined process using scientific material and human endeavour to achieve human progress.
> (*Education for the Industrial Society's Science and Technology Study Group, 1977*)
>
> Technology is the process of using scientific material and human resources to raise the quality of life.
> (*International Symposium on Current Trends in Science Education [see CCC/COT paper 82/4]*)
>
> Technology is the purposeful use of man's knowledge of materials, sources of energy and natural phenomena.
> (*Schools Council Project Technology*)
>
> Technology is a disciplined process by which the resources of knowledge (of materials, of energy, of the concepts of science, of technical concepts etc) are used in the practical solution of problems identified by human need.
>
> In technology the ultimate purpose is to exploit existing scientific or other knowledge for productive ends, whether or not all the processes involved are currently capable of scientific explanation.
>
> Technology is a creative activity involving not only the application of science but also the resolution of complex economic and sociological problems.
> (*Schools' Council Project Technology quoted in "Technology in Schools", CCC/COT Paper 82/22*)

From *Design and Technological Activity: a framework for assessment*. DES/APU, KELLY *et al* (1987).

> The basic premise of design and technological activity (D and TA) is that, using materials, tools and systems, human beings can intervene to modify and improve their environment. Underlying this intervention is the motive of responding to human needs.
>
> In an educational context, pupils pursuing this activity must learn to exercise a range of strategies, which are dependent upon the application of relevant knowledge and a variety of skills. The whole activity is governed and given meaning by the human values that surround the task. (p8)

Design and technological activity is

> a practical activity requiring not only knowledge but also understanding and sensitivity. To be involved in design and technology is to be involved in a particular type of integrated activity - based on the interaction of human beings with the physical and technical realities of the material world. (p18)

Technological capability is

> that which enables a person to enrich the quality of life by using technological skills, knowledge and value judgements in the development of man-made environments and man-made things. (Appendix I)

From *Report of Survey of Design and Technological Activities in the School Curriculum: part 2*. DES/APU (1983).

> ... individual teachers viewed the definition of technology as having two different, though related, aspects, namely (1) technology in general terms of its potential for effect on the quality of life. This appeared to be accepted by most teachers as being the more important aspect and having the clearest meaning.
>
> (2) technology in terms of its skills, knowledge and values. Teachers variously saw this definition, especially in the area of knowledge, either as being too wide or too narrow. (pp41-42)

From Clegg, (1987), Handing down technology in schools: who teaches it? How and why? *School Science Review*.

> Technology involves the manipulation of natural things to fulfil a human need. This involves a design-and-make process which usually results in an artefact.

From *Curriculum Matters: 2 The Curriculum from 5-16*. DES, (1985).

> The essence of technology lies in the process of bringing about change or exercising control over the environment. This process is a particular form of problem solving; of designing in order to exert control. It is common to all technologies including those concerned with the provision of shelter, clothing, food, methods of maintaining health or communicating with others and also with the so-called 'high technologies' of electronics, bio-technology, fuel extraction, and the alternative technologies of the Third World. As in all learning, the involvement must be characterised by progression, internal coherence and continuity. But technology also has its content which, while not exclusive to it, is essential to the technological process. That content broadly concerns the nature and characteristics of natural and manufactured materials, and the nature, control and transformation of energy.

and

> Technology is about 'people' controlling things, not 'things' controlling 'people'. (p89)

From *Technology across the Curriculum*. School Technology Forum, (1986).

Technology is ...

> a disciplined process using scientific material and human resources to achieve a human purpose.

From *Understanding Design and Technology*. DES/APU (1981) (quoted in APU, (1983)).

> The development of an understanding of Design and Technology in a child, therefore, cuts across many subject barriers and may be derived from ideas, values, knowledge and skills acquired through experience in, for example, Art, Craft, Environmental Studies, Geography, History, Home Economics, Mathematics, Science and Social Studies as well as through attendance at classes containing the words 'Design' or 'Technology' as part of their titles.
>
> [...] assessment should go beyond awareness and understanding, [...] and centre on technological capability [ie] the ability of an individual pupil to control or fashion the material environment by personal intervention in order to improve or enrich the quality of life.

From *Living with Technology: a foundation course. Block 1: Home*. Open University Press, (1987).

> Designing is one of the most important activities of the technologist, since designing is concerned with creating new things by the application of knowledge to practical tasks. [This block] tries firstly to develop your *awareness* through analysis and evaluation [...] and secondly to develop your design *ability* through a model design task. (p6)

From *The Place of Home Economics in Technology*. NATHE 1988.

> Technology has direct implications of life styles and the home environment of all people - morally, socially, politically and aesthetically. It is essential we produce an educated public who can make well-informed decisions so that technology will ensure a good quality of life for all - worldwide. (p2)

From *Technology in Schools*. HMI Report (1982) (definition used by East Anglian Examination Board).

> Technology is concerned with the identification of the needs of man and the endeavour to satisfy these needs by the application of science and use of material resources and energy. It is concerned with solving problems where there is no right or wrong answer, only good or bad solutions to a problem. Technological behaviour requires activities that are creative and demanding, where the laws and principles of science, the constraints of society and economics are applied to problems of satisfying human needs. Technological behaviour involves approaches and techniques such as system analysis, problem identification, decision making, planning, ideal communication and solution evaluation, that are more than pure science or craft.

A very similar definition was adopted by HMI (1986) in *A Survey of Technological Education in Secondary Schools in Mid Glamorgan, South Glamorgan and Gwent.*

From BLACK *et al* (1988) *Technology Education Project 1985-1988.*

> The project saw Technology's role as the exploitation of all knowledge (both scientific and non-scientific) for creative and productive activities in the interests of society. It is appreciated that this essential and almost totally interdisciplinary nature of technology was at variance with the discrete discipline of the conventional school curriculum. Furthermore its basic processes of designing, making and getting things done were at variance with the knowledge-based courses and knowledge-recall criteria of traditional examinations. (p5)
>
> There is a sharp overlap but not total identity between 'Design' and 'Technology'. (p24)

From *TVEI: Technology across the Curriculum: the technological process*. Bedfordshire Education Service (1987a).

The Technological Process is defined as:

> (a) identification of a problem, opportunity or issue that can be solved or addressed through an activity *either* using (in an active not passive way) modern technological equipment *or* requiring the demonstration of skills to model an artefact or system involving technology;
>
> (b) an analysis of the issue and the planning/designing of a solution including the identification of the resources needed to implement that solution;
>
> (c) the collection, or production or interpretation of data necessary to solve the problem;
>
> (d) the generation of ideas for solutions and the selection of an appropriate solution;
>
> (e) the demonstration of the appropriate skills to *either* use modern technological equipment *or* model the artefact or system involving appropriate technology;
>
> (f) evaluation against the specification;
>
> (g) in certain cases a seventh step may be appropriate; the development of a business activity to test the product in a commercial setting.

From Home Economics by any other name, *New Home Economics, 34/6*, Geen and Daniels, (1988).

These authors, using the *School Technology Forum* (1986) definition as a starting point, devised a set of criteria by which 'technology' may be characterised.

> Technology implies a *systematic* study of the design, production and use of artefacts, systems, ideas or personnel.
>
> Technology also includes *processes or methods* by which some objective is attained.
>
> Technology is frequently employed to *adapt* the environment.
>
> Technology reflects our constant desire for *efficiency* ie achievement of objectives for the minimum expenditure of time, resources, labour and energy.
>
> Technology's ultimate purpose is to promote *human well-being.*
>
> (Our emphasis)

From APU (1981) *Understanding Design and Technology.*

> the ability of an individual pupil to control or fashion the material environment by personal intervention in order to improve or enrich the quality of life.

From ANON (1982) HMI spreads the gospel of technology, *TES.*

This article puts forward four criteria by which to assess or evaluate courses.

> Courses must be concerned with *controlling the environment to meet human need.*
>
> Pupils must be *actively involved* in *designing and making* or in *devising working systems.*
>
> Problems should be considered which require the use of *specific and other appropriate knowledge.*
>
> Pupils must be helped to build up general understanding of technological concepts especially those relating to *energy, control, materials and communication.*
>
> (Our emphasis)

From TVEI (1988) *Technology for TVEI.*

> The purpose of including technology in the curriculum for all students is to help them to develop into autonomous adults, regardless of career, who are sufficiently knowledgeable and competent to join in the process of personal, community and national decision making and able to make their own contributions to the social and economic viability of the country.

This document also provides a list of questions which schools and education authorities can ask themselves when planning the integration of technological activities into the curriculum.

APPENDIX 2

Some definitions of home economics

From DES (1985) *Home Economics from 15-16.*

> The primary aim of teaching home economics [...] is to prepare boys and girls for [...] everyday living and the adult responsibilities of family life. All pupils [...] require to gain competence and to make informed choices in matters of hygiene, safety, health and diet. [...] some will earn their living caring for, feeding, clothing and helping to shelter other people, [...] as they are looking after themselves. Boys and girls need to learn how to organise their time and make use of available resources to best effect in matters to do with homes and households, and, although theory and knowledge are important[...] they should be closely related to the performance of practical tasks.
>
> Much of the work [...] at every stage should be of a practical and investigative nature. Pupils should be encouraged to judge and improve their own performance as well as receiving the necessary stimulus, guidance and help from the teacher.
>
> Teaching methods should encourage the development of pupils' critical and analytical skills and the ability to transfer knowledge and understanding intelligently from one situation to others. Providing opportunities for pupils to think for themselves is essential if they are to consolidate learning and gain confidence in making the judgements and decisions which will be required of them in daily living.

From Cumming *et al* (1985) *Where Does the Proof Lie?*

These authors provide a definition which seeks to justify the inclusion of home economics in the S3/4 curriculum.

> Home economics is concerned with using and managing human and material resources for the benefit of individuals, of families and, where appropriate, of communities. It draws from at least three very different ways of knowing about the world - scientific, creative/aesthetic and social. The ways the subject is taught reflect the range of methods used by the contributory disciplines. It has social usefulness and relevance for pupils for it focuses on the home which lies within the current or future experience of all young people. It aims to provide pupils with a coherent map of knowledge, skills and values so that they can make informed decisions about key aspects of the home.

From Institute of Home Economists (1983).

Home economics is

> a study of the inter-relationships between the provision of food, clothing, shelter and related services, and man's physical, economic, social and aesthetic needs in the context of the home.

From Higgins (1985) Don't be a dinosaur, *TES,* 19/4/85.

> Home economics is an interdisciplinary subject, embracing the learning and application of theory, principles and practice within its area. Through home economics pupils use the familiar situation of the household and social group as the platform from which to study the best use of physical and material resources through the process of investigation, problem solving, interpretation of data and information, management, use of money, actually 'doing', manipulative dexterity and awareness.

APPENDIX 3

Aims and objectives of home economics courses

1. From CCC's *Curriculum Guidelines for Home Economics S1/S2* (1987).

Home Economics courses for S1/S2 pupils in Scotland should encourage pupils to be adaptable, to gain in confidence and experience enjoyment.

Courses should provide S1/S2 pupils with opportunities:

1. To develop their knowledge and skills through practical experiences which are related to everyday life in the home.

2. To develop their creative, sensory and manipulative skills in areas of learning associated with the home.

3. To experience personal satisfaction and a sense of achievement in the successful execution of a task.

4. To select with reasons the most suitable materials, equipment and procedures for some everyday tasks in the home.

5. To use selected materials, equipment and procedures correctly with due attention to safety and hygiene.

6. To develop appropriate interpersonal skills through the context of shared experiences and activities in the classroom related to the home.

7. To develop their awareness of similarities and differences in lifestyles and culture.

8. To develop their ability to organise and manage their own time and money.

9. To develop a sense of responsibility for their own actions and behaviour within the family.

10. To become aware that there are services within the community to support the everyday needs of the family.

2. The Standard Grade *Arrangements for Home Economics* (SEB, 1987) provide the following statements of aims:

As a basis for course planning the ideas of the rationale of the subject have been developed into aims suited to the needs of pupils in S3 and S4. These aims are designed to reflect the contemporary nature of Home Economics, coupled to the needs of young people, for an action based learning experience.

The aims represent an overall emphasis on skills, particularly organisational skills. Skills may be developed in a variety of ways, all based on practical situations, using a range of approaches.

The aims are as follows:

1. To provide a sound basis of knowledge and skills which will stimulate and sustain an interest in and enjoyment of Home Economics.

2. To develop the knowledge and skills required to enable young people to make reasoned and informed decisions - decisions related to the organisation and management of resources and human potential in order to satisfy the needs of individuals within the family group.

3. To develop an understanding of and give practice in the use of the principles underlying the critical choice, and the safe and informed use of equipment, materials and procedures.

4. To provide meaningful experiences and opportunities for personal fulfilment in creative, sensory and manipulative skills.

5. To help young people towards an understanding of the needs of different members of a family group.

6 To equip young people with organisational skills necessary to meet the needs of individuals and family members within a rapidly changing society.

From these aims ten course objectives have been derived.

3. Standard Grade Course Objectives

Within the elements pupils will develop a number of skills. These skills are prescribed in terms of the Course Objectives listed below and will serve as reference points from which teachers will develop their own courses.

Knowledge and Understanding.

1. To acquire a knowledge of facts, terminology, concepts and principles.

2. To use facts, terminology, concepts and principles.

Handling Information.

3. To interpret information presented in a variety of forms.

4. To select, from reference sources, information relevant to given specification.

5. To draw a conclusion from information.

Practical and Organisational Skills.

6. To acquire manipulative skills.

7. To carry out a practical task.

8. To plan a course of action.

9. To carry out a planned course of action.

10. To evaluate a course of action.

Intrinsic to this element will be the provision of opportunities to apply principles of safe and hygienic practice and of opportunities to develop creative aspects.

4. All GCSE home economics courses must work towards the following aims.

To develop pupils' awareness of the inter-relationships within home economics.

To increase pupils' understanding of the physical, social, emotional, intellectual and aesthetic needs of people which change throughout life according to circumstances.

To develop the qualities of sensitivity and aesthetic appreciation needed to create and maintain a personal environment, as distinct from the total environment.

To develop an understanding of interdependence and interaction within family and community in the setting of a culturally, socially and economically diverse society.

To develop the knowledge and skills required for the effective organisation and management of family resources, in relation to the needs and life-styles of members.

To foster an appreciation of the concern of all syllabuses in home economics with the achievements of both short-term and long-term goals (eg a meal can satisfy immediate hunger while contributing to the achievement of a diet conducive to good health).

To enable pupils to become adaptable to rapid technological changes and the growth of scientific knowledge.

To develop an awareness of the implications and applications of technology in the home and to develop competence in its use.

To enable pupils to appreciate the consumer situation, and to assess the effectiveness and validity of claims made by advertisers.

To support the aims of the whole curriculum by fostering inventiveness, originality, creativity and academic rigour.

To stimulate and sustain an interest in and enjoyment of home economics.

To develop an awareness of relevant mandatory and other necessary safety requirements.

GCSE The National Criteria, DES and Welsh Office (1985).

5. **The GCSE aims were amplified as follows in an Open University teachers' guide (1986):**

The aim of GCSE courses in home economics is to help students of both sexes to lead effective lives as individuals and as members of a family and community within the context of a culturally, socially and economically diverse society.

Home economics is an integrated field of study. What unifies the subject is not the content, but the inter-relationships between the study of the four major areas: family, food, home and textiles.

These inter-relationships are revealed through the study of a number of common themes: human development, health, safety, efficiency, values, aesthetics, and interaction with the environment.

Home Economics is an applied subject, and is concerned with both theory and practice. The theoretical nature derives from the perception of family, food, home and textiles as resources. The practical nature derives from the need to manage these resources in practical situations.

(SEC and OU, 1986)

The definition of home economics in the National Criteria focuses on an investigational approach in which problem solving, the use of design briefs, research projects and the construction of products are all part of the subject area. It would not be appropriate to learn about, for example, fabrics or nutrients without reference at some point to their applicability to family and home.

As we have seen, the definition of the subject also draws attention to the important link between provision and need.

6. A sample syllabus for the first GCSE examination in 1988 in Home economics: home and food (1986) is clearly based on the general aims.

The aims of a course of study leading to the examination will be:

To develop pupils' awareness of the inter-relationships within home economics.

To develop the knowledge and skills required for the effective organisation and management of family resources, in relation to the needs and lifestyle of members.

To enable pupils to become adaptable to rapid technological changes and the growth of scientific knowledge.

To develop an awareness of the implications and applications of technology in the home and develop competence in its use.

To develop an understanding of interdependence and interaction within family and community in the setting of a culturally, socially and economically diverse society.

To foster an appreciation of the concern of all syllabuses in home economics with the achievements of both short-term and long-term goals.

To increase pupils' understanding of the needs of people which change throughout life according to circumstances.

To develop pupils' ability to weigh evidence and make and justify decisions in the light of evidence.

To support the aims of the whole curriculum by fostering inventiveness, originality, creativity and academic rigour.

To stimulate and sustain an interest in the enjoyment of home economics.

To develop an awareness of relevant mandatory and other necessary safety requirements. *Northern Examining Association*

7. Standard Grade: essential knowledge.

(from *Revised Arrangements in Home Economics*, p13)

5.1. To meet the demands of national certification, all courses must include, and develop from, the knowledge in the statements in 5.2. This knowledge, which extends over all three contexts, will be an integral part of the course and will be reflected and deployed beyond the element of Knowledge and Understanding in the processes of Handling Information and Practical and Organisational Skills.

The essential knowledge has been selected carefully to ensure suitability for all pupils, from varying social, economic and cultural backgrounds. Similarly, the items will be equally capable of being taught in schools throughout the country where conditions and circumstances differ considerably.

The essential knowledge identified does not set out limits for the facts and experiences on the basis of which courses will be planned. It should be an integral feature throughout the course rather than confined to one part of it. Essential knowledge will be assessed only within one element, that of Knowledge and Understanding, though it will be used as a basis for some of the assessment within the other elements.

The essential knowledge is the same for all levels. Differentiation should be made through pupils' performance as measured by the Grade Related Criteria.

5.2 The essential knowledge is as follows:

Eating a variety of foods contributes to good health.

Individuals have varying dietary needs.

Current dietary advice should be considered in relation to good health.

Safe practices are important in the use of resources and procedures.

Design features are an important consideration in the choice of materials and equipment.

Individuals and families have different physical needs.

Management of personal and household expenditure depends on priorities.

8. Higher Grade Home Economics (*Revised Arrangements*).

Rationale and Aims

The purpose of home economics at the senior stages of the secondary school is to prepare young people in important skills of living, whether as individuals or members of a family. These skills are of value in the establishment and development of a stable home environment and in preparing young people for employment opportunities and involvement in the community.

Home economics offers a variety of learning experiences which allow the development of these skills.

In pedagogical terms, the skills can be identified as cognitive, creative, management and problem solving, and also as technological.*

The development and integration of these skills can be pursued through a study of the management of resources. Resource management offers scope for a range of interpretations which can be matched to the maturity, interest and ability of candidates of both sexes, and can be applied in a home or vocational context.

Home economics is concerned with social, economic and technological change as it affects individuals and families in contemporary society. The emphasis in the revised course on process-based learning and transferable-skills allows the flexibility which is required to make a ready response to such change.

The course, giving a high priority to problem solving as a creative process and an integrated activity, demonstrates the characteristics of a technological mode of experience. The concern of the subject with identifying and responding to human needs confirms its position in this mode. Through study and investigation during the course, candidates should endeavour to ascertain how these needs could be met by the systematic application of appropriate skills and knowledge.

In addition, the course offers opportunities for practical experience in using new technologies and contributes to candidates' confidence in these areas. The inclusion of such experiences helps to overcome the acknowledged indifference of some female candidates to technology in the wider sense.

* See The Place of Technology in the Secondary Curriculum: a COSE discussion paper (Consultative Committee on the Curriculum, 1985).

In common with other subjects, the course contributes to personal development. In recognition of the growing maturity of candidates the course offers opportunities to experience a range of study skills and encourages a structured approach to independent learning.

9 Revised Higher Grade Home Economics - Aims.

The following aims have been derived from the rationale and offer a basis for course planning.

a To provide opportunities which will allow the acquisition of knowledge and understanding of the factors which influence the choices and decisions made by individuals and families.

b To develop skills of analysis and evaluation through a study of the materials and resources necessary for the identification of, and responses to, the physical and social needs of individuals and families.

c To develop an awareness of the interdependence of different members and groups within the family.

d To develop the management skills necessary for the effective use of materials and resources and for the application of these skills.

e To demonstrate a positive response to social and technological change.

f To offer opportunities to use practical skills for creative and investigatory purposes through problem-solving and technological activities.

g To offer opportunities for personal development in the areas of initiative, responsibility, co-operation and adaptability and to encourage a positive attitude to independent learning.

APPENDIX 4.1

How home economics could provide opportunities for pupils to experience each of Black and Harrison's three dimensions of technology education.

RESOURCES	KNOWLEDGE	family and society, food, materials, fabric, energy
	SKILLS	investigating, problem solving, decision-making, analysing, manipulating, evaluating, planning, communicating
	EXPERIENCE	a wide range of home orientated activities allow pupils to build on their own knowledge and experience.
CAPABILITY	IDENTIFYING FACTORS	eg time, cost, appearance, performance, texture, taste, constraints, opportunities
	GENERATING IDEAS	- and investigating alternatives
	PLANNING	- events, utilisation of resources, time
	EVALUATING	- considering effectiveness of outcomes
	COMMUNICATING	- findings and conclusions (handling information)
	APPLYING KNOWLEDGE	- scientific and other concepts
	DEVELOPING RESPONSIBILITY	- concern for others, being reliable
AWARENESS PERCEPTION AND UNDERSTANDING	Facts alone are insufficient to prepare people for adult life. Pupils need to develop a critical awareness and understanding in order to operate successfully in a modern technological society. In home economics pupils' awareness is developed by:	
	EXPLORING	aspects of the nature and role of technology in society
	EVALUATING	the impact of information technology and control technology in household management systems
	ANALYSING	criteria for informed consumer choice, fitness for purpose, quality, form and function of design, ergonomic efficiency, health and safety
	ENCOURAGING	development of personal values, judgement, aesthetic, economic and social considerations
	STIMULATING	ability to appraise critically technological change

Based on Page 4 *The Place of Home Economics in Technology*, NATHE, 1988

APPENDIX 4.2

Grid to show how the Aims for the Standard Grade Home Economics course could relate to the technology attributes defined in Part 1.

Defining attributes of technology / Standard Grade Course Objectives	1/ Some of the material needs of man	2/ Systematic study of design, production and use of artefacts, systems, ideas	3/ Adapting the man-made environment	4/ Open-ended practical problem solving	5/ Efficiency	Notes
1/To *acquire a knowledge* of facts terminology, concepts and principles	✓	✓	✓		✓	Knowledge of materials, energy sources, food stuffs
2/To *use* facts, terminology, concepts, principles	✓	✓	✓		✓	Cooking processes etc could all contribute to technology
3/ To *interpret information* relevant to a given specification	?	?	?	?	?	These skills are non-context specific - they could relate to technology
4/ To *select* from reference sources information relevant to a given specification	?	?	?	?	?	
5/ To *draw a conclusion* from information	?	?	?	?	?	
6/ To *acquire* manipulative skills	✓	✓	✓	?	?	Using tools and equipment
7/ To *carry out* a practical task	✓	✓	?	?	?	Most practical tasks have a purpose but may be routine
8/ To *plan* a course of action	?	✓	?	?	✓	May relate to No 4 - depends how problem is framed
9/ To *carry out* a planned course of action	?	✓	?	✓	?	May relate to No 4 - depends how problem is framed
10/ To *evaluate* a course of action	?	✓	?	✓	✓	Efficiency is one factor to consider in evaluation

APPENDIX 5: Open University Courses in technology

The first of these, *Living with Technology: a course for teachers* (ET217) provides a general background in technology along with ideas about its role in schools. Based on the *Technology Foundation* course (*Living with Technology* - T101) it covers seven topics: the home, communication, energy, resources, food, health and the effects of micro-electronics on employment. Many of these topics would be relevant to home economics teachers and would help to raise their awareness of technology. Another course on offer is *Technology in Secondary Schools*(PT539) which comes in the form of a study pack (£18.77) which should be ideal for those interested in introducing technology into their school or into an authority's in-service provision. There is also a conversion course *Technology and Education* (ET517) for those who have already taken course T101 as part of their undergraduate studies. It comprises three texts: *Technological Education; Case Studies; Technology, Society and Education*. Together with course T101 this course forms part of the Advanced Diploma in *Technology in Schools* which is eligible for subsidy. It is designed to be of particular interest to science, craft design and technology and home economics teachers. It lasts for a minimum of two years and comprises two parts. (see table below)

<table>
<tr><th colspan="3">Open University's Advanced Diploma 'Technology in Schools'</th></tr>
<tr><td>PART A</td><td colspan="2">ET217 Living with technology
ET517 Conversion course: Technology and education

(This is for those students who have already passed T101 'Living with Technology' as part of their undergraduate course).</td></tr>
<tr><td rowspan="4">PART B</td><td>ROUTE 1</td><td>ROUTE 2</td></tr>
<tr><td colspan="2">MODULE 1
Design, process and products</td></tr>
<tr><td>MODULE 2
ET887
Food production systems</td><td>MODULE 2
ET 897
Instrumentation</td></tr>
<tr><td colspan="2">MODULE 3
Manufacturing</td></tr>
<tr><td colspan="3">MODULE 4
Application of what has gone before to the technology curriculum design - (across subjects or as a separate course). The curriculum to include: problem solving, design, creativity and cognitive processes, pupil attitudes and values, teaching methods, assessment.</td></tr>
</table>

Abbreviations used in the text

APU	:	Assessment of Performance Unit
CCC	:	Consultative Committee on the Curriculum
CDT	:	Craft, Design and Technology
COSE	:	Committee on Secondary Education
COT	:	Committee on Technology
CSG	:	Central Support Group
DES	:	Department of Education and Science
GCSE	:	General Certificate of Secondary Education
GTC	:	General Teaching Council
HMI	:	Her Majesty's Inspectorate
ILEA	:	Inner London Education Authority
INSET	:	In-Service Education and Training
LEA	:	Local Education Authority
MEG	:	Midlands Examining Group
NATHE	:	National Association of Teachers of Home Economics
NC	:	National Certificate
OU	:	Open University
PICKUP	:	Professional, Industrial and Commercial Updating
RSA	:	Royal Society of Arts
SCCC	:	Scottish Consultative Committee on The Curriculum
SCDS	:	Scottish Curriculum Development Service
SCE	:	Scottish Certificate of Education
SCOTVEC	:	Scottish Vocational Education Council
SCRE	:	Scottish Council for Research in Education
SEAC	:	Schools Examinations and Assessment Council
SEB	:	Scottish Examination Board
SEC	:	Secondary Examinations Council
SED	:	Scottish Education Department
TAC	:	Task -Action-Capability
TRIST	:	TVEI Related In-Service Training
TS	:	Technological Studies
TVEI	:	Technical and Vocational Education Initiative

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